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PRIMARY INFECTION IN TUBERCULOSIS

A STUDY OF SIX THOUSAND THREE HUNDRED AND TWENTY-NINE FLUOROSCOPIC EXAMINATIONS OF CHILDREN *

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I shall discuss primary tuberculosis in the child, with particular reference to the results obtained in a statistical analysis of 6,329 fluoroscopic examinations made in the University of Vienna Kinderklinik (in the service of Professor Pirquet) from 1921 to 1924, inclusive. These cases represent all the fluoroscopic examinations of the lung made in the outpatient department, and are from an aggregate of 40,818 patients consecutively examined. None of these children were well, that is, none were simply prophylactically examined, but they were brought to the clinic because of fever or anorexia, pallor or loss of weight, or cough of the Schick or productive type, or were examined in order to clarify or confirm physicial observations.

The relative incompleteness inherent in records from the outpatient department, largely because of lack of cooperation and ignorance on the part of the children's parents or guardians, of failure to return for follow-up treatment and of the changing personnel of physicians, necessarily rob this study of many valuable details.

A proper conception, recognition and localization of the primary infection of the lung in tuberculosis presupposes an understanding of certain anatomic features within the thorax which I shall deal with in a general way. The pathogenesis of primary tuberculosis, as well as its fluoroscopic recognition, will be dealt with, and a comparison of the analysis of my observations with those of other pathologists and roentgenologists will be made.

ANATOMY

Variation in the division of each lung into lobes is not uncommon, so that, although as a rule the right lung has three lobes—upper, middle and lower—and the left lung has two—upper and lower—there may be a further subdivision into more lobes or only an incomplete separation

* Received for publication, Oct. 5, 1926.

* From the University Kinderklinik of Vienna: Professor Pirquet (service of Dr. Wimberger).

into the usual number. Kreuzfuchs and Schuhmacher [1] have suggested that the upper and lower lobes really should be called anterior and posterior; while their suggestion is justified by the clearer and more exact anatomic picture of lobar position that such a change would convey, it will hardly be acceptable in a nomenclature already overburdened.

Each lung is subdivided into its lobes by fissures, and the topographic markings of these interlobar fissures, as described by many authors, vary because of the wide range of normal anatomic deviations, as shown particularly by Rochard.[2] For practical purposes, it may be assumed that the usual markings are represented as shown below.

Left Interlobar Fissure.—This consists of a line beginning from 6 to 8 cm. below the apex at about the level of the third dorsal vertebra, extending from the posterior margin of the medial surface of the lung, backward and slightly upward to the posterior surface, then arching slightly over the posterior convexity and downward; it crosses the fourth interspace in the midaxillary line, to the level of the sixth costal cartilage, cutting the lung above the cardiac incisure. Thus it makes of the inferior part of the lower lobe what was called by Luschka [3] a tongue-shaped process of lung, which is now known as the lingula. This represents the external marking of the left (great) interlobar fissure; the diaphragmatic and mediastinal markings were not portrayed until Fleischner [4] adequately described them. If the line described in the foregoing is continued dorsally and medially on the diaphragmatic surface toward the lower medial margin of the lung below the hilum, then extended slightly dorsally, upward to the hilum and from above it steeply to the level of the third dorsal vertebra, the diaphragmatic and mediastinal markings are obtained. Because of the predominantly left-sided position of the heart, only a narrow part of the upper lobe has a diaphragmatic surface.

The right side shows differences from the left and may be represented thus:

Right Interlobar Fissure.—This is a line starting at the level of the third dorsal vertebra as the one on the left side does, extending posteriorly to the posterior convexity of the lung, over which it then arches with a convexity even less marked than on the left side, and therefore begins its descent toward the axilla on a less steep incline. The diaphragmatic surface is reached in the anterior or midaxillary lines, or between the two; from there it takes its course on the diaphragm obliquely, posteriorly and medially toward the lower part of the hilum, the lung tissue lying anteriorly and medially (middle lobe), thus comprising one fourth of the diaphragmatic surface. The mediastinal course is similar to that of the left side. The fissure between the upper and middle lobes of the right side is represented by a line practically horizontal and at the level of the fourth rib, extending laterally to the great fissure.

The interlobar fissures are to be thought of as surfaces, and these surfaces are not plane. If the great fissure markings as given are projected on a flat surface, then there will be seen a propeller-like figure,

1. Kreuzfuchs and Schuhmacher: Die topographische Verhältnisse der interlobaren Lungen spalten, Acta radiol. **1**:284, 1922.

2. Rochard: Topographie des scissures interlobaire du poumon, Gaz. d. hôp. **23**:211, 1892.

3. Luschka: Anatomie des Minschen Tübingen, 1863, vol. 1, p. 283.

4. Fleischner: Lobäre und interlobare Lungenprozesse, Fortschr. a. d. Geb. d. Röntgenstrahlen. **30**:185, 1922.

as described by Dietlen [5] or a "figure 8" (fig. 1). The figure on the left side has longer and narrower loops.

These fissures may be visualized as oval surfaces which, lying at an angle of 45 degrees with the bases of the lung, have been twisted on themselves with the level of the hilum as the fulcrum, so that the upper half faces forward and slightly laterally, and the lower half faces forward and somewhat medially. The small fissure on the right side, called "domeshaped" by Fleischner,[7] is inclined laterally more than anteriorly, and has an upward convexity which is more marked dorsocentrally than mediolaterally.

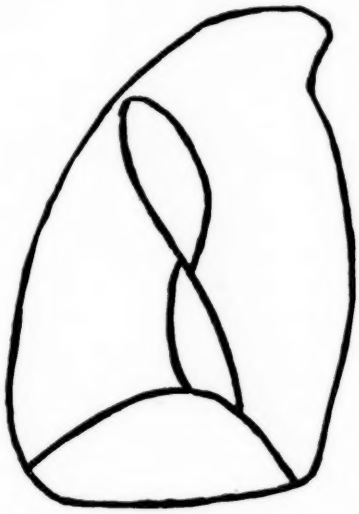

Fig. 1.—The great interlobar fissure (after Dietlen).

Because the fissures vary in their depth, complete separation into lobes is variable; there may be only a pleural bridge connecting two adjacent lobes, or only a small pulmonary pedicle; two lobes may be continuous one with the other, so that only a small superficial separation occurs. This is of importance when interlobar pathologic changes are considered.

The pleurae should be thought of as a serous membranous sac, which is so invaginated at the hilum by the lung that the costal diaphragmatic and the interlobar mediastinal surfaces, except in the area in which the vessels and bronchi enter, are completely covered by a serous membrane, so that each of these surfaces has two adjacent layers of pleurae.

5. Dietlen: Ueber interlobare Pleuritis, Ergebn. d. inn. Med. u. Kinderh. **12**:196, 1913.

6. Fleischner (footnote 4, page 184).

7. Fleischner (footnote 4, page 186).

LYMPHATIC SYSTEM OF THE LUNGS

The drainage and anastomoses of the lymphatic system of the lungs and pleurae is of great practical interest in the consideration and understanding of tuberculosis of the lung.[8] The lymphatic system of the thorax will be considered briefly under two divisions: (1) the lymph vessels, and (2) the lymph glands. I am concerned particularly with the pleurae and the lungs. Subpleurally, a meshwork of lymphatic channels surrounds each lobe; deeper, a closed tube system of lymphatic vessels and channels lies within the lung tissue along the vessels and bronchi. The superficial subpleural system and the deeper system communicate with each other by anastomosis, and flow into the bronchopulmonary glands.

The lymphatic system of the thorax is composed of five main groups of glands: (1) sternal or retrosternal, (2) internal intercostal, (3) anterior mediastinal, (4) posterior mediastinal and (5) bronchial lymph gland system (so called by Merkel [9]), or tracheobronchial lymph glands (Sukiennikow [10]).

The last group is of decided importance, particularly to the pediatrician and the roentgenologist, for an understanding of it will aid in the clarification and appreciation of primary tuberculous infection of the lungs, with its concomitant involvement of the hilum gland, which presupposes a knowledge of the topographic anatomy of the tracheobronchial lymph nodes. Near the lower trachea at its bifurcation (at the level of the third dorsal vertebra) and around the two main bronchi up to their entrance into the lung tissue, the glands are called tracheobronchial. When the glands reach the branching of the bronchi within the lung tissue, they are called bronchopulmonary. The tracheobronchial pulmonary nodes drain only the respiratory organs, the trachea, bronchi and lungs, and are in immediate contact with them. Other intrathoracic glands (carotid and aortic) may show changes coincident to those of the tracheobronchial glands, but do not, strictly speaking, belong to that group. The bifurcation of the trachea causes three definite angles, in each of which a constant group of lymph glands enmeshed by fat and connective tissue is found, the nomenclature corresponding to the location of the angles, namely, left tracheobronchial lymph glands, right tracheobronchial lymph glands and inferior or bifurcation tracheobranchial lymph glands.

Similarly, whenever a branch is given off by a bronchus (whether within or outside of the lung) a lymph gland or a group of lymph glands is situated at the distinct angles thus formed. Sukiennikow [10] found intra-

8. Bartels: Das Lymphgefäss system, Jena, 1909, p. 181.
9. Merkel: Die Anatomie des Menschen, Jena, 1902, vol. 6, p. 174.
10. Sukiennikow: Topographische Anatomie der Bronchialen und Trachealen Lymphdrüsen, Berl. klin. Wchnschr. **14**:316, 1903.

pulmonary or hilum lymph glands at the bronchi or their branches. The number of tracheobronchial lymph glands is given as from fifty to sixty, and they are found to decrease in size and number the farther from the trachea they lie, so that only one or two may be found at an angle within the lung tissue. The glands are not uniform in size, and nodes usually are not seen when they are normal, but if two or more are confluent, one larger gland may be seen. At birth, they are the size of a millet seed and grow during the first few months to the size of a lentil; in adults they may reach the size of a pea or sometimes that of a bean. They may be flat, oval or round, depending on the contiguous structures and angles. Only in pathologic conditions do they fill spaces so as to make impressions on organs. The glands are much richer on the right side, and lie anterolaterally to the trachea and bronchi.

The bronchopulmonary lymph glands are bound together by connecting chains of lymph glands and these are bound in the same way to the three main groups which have anastomotic connections with one another. There is no known direct communication of the tracheobronchial lymph glands with the lymph glands of the abdomen.[8] The foregoing classification is that of Sukiennikow,[10] which has been accepted generally.

Engel,[11] in a study of the lungs of children which were injected intravenously, fixed with solution of formaldehyde and studied in series, offers some variations. He could not confirm the close relationship of the glands to the bronchial tree, their number or the connecting chains of lymph glands of Sukiennikow. His classification of the lymph glands, which is of importance in consideration of hilum tuberculosis, is as follows: (1) bifurcation; (2) bronchopulmonary, right and left; (3) pretracheal medial; (4) epibronchial sinistra; (5) ductus botalli; (6) arch aorta; (7) paratracheal, right and left, and (8) angle anonymi. The names imply their location.

PATHOGENESIS

Primary infection with tuberculosis in children may be pulmonary or extrapulmonary; if it is the latter, it may be intestinal,[12] dermal and genital,[13] middle ear,[14] in the parotid gland,[15] in the nose,[16] in the con-

11. Engel: Die okkulte Tuberkulose in Kindesalter, Tüb. Biblio., no. 12, 1923, p. 62.

12. Ghon and Potatchnig: Ueber den Unterschied in Pathologisch-anatomischen Bildern der Lungen und Darm Tuberkulose der Kinder, Beitr. z. klin. d. Tuberk. **40**:87, 1919.

13. Holt, L. E.: Tuberculosis Acquired Through Ritual Circumcision, J. A. M. A. **61**:99 (July 12) 1913.

14. Ghon: Der primäre Lungenherd bei der Tuberulose des Kindesalter, Vienna and Berlin: Urban and Schwartzenberg, 1912. Zarfl: Das Mittelohr als Sitz des Tuberkulosen Primärherdes, Wien. med. Wchnschr. **22**:1114, 1924.

junctivae of the eyelid [17] and in the tonsils.[18] By far the greatest number of primary infections are in the lung, so that primary tuberculous infection is practically synonymous with primary pulmonary infection.

In his first series of 184 cases, Ghon [18] found 162 subjects, or 88.05 per cent, in whom the lung was the primary point of entrance; in three patients, or 1.63 per cent, the point of entrance was the small intestine; in one patient, or 0.54 per cent, the skin was the point of entrance; in one, or 0.54 per cent, the point of entrance was the tonsils. Although fifteen patients, or 8.15 per cent, showed lesions in organs other than the lung which might have been coincident with the lung infection, Ghon assumes that more than 95 per cent had the primary infection in the lungs.

While the possibility of congenital tuberculosis is admitted by Beitzke,[19] Kaufman,[20] and others, it is such a rare condition that it has no practical application. There are three possible ways of transmission of the Koch bacillus to the lungs, namely, hematogenous, lymphogenous or aerogenous; the first two presuppose a preexistent focus of tubercle bacilli in the body. The bulk of pathologic evidence favors the aerogenous route as the probable one. Aschoff [21] believes that, practically speaking, there is only one way of contracting tuberculous infection of the lung in childhood, and that is through the lung itself. Ghon,[18] Beitzke,[19] Erdheim,[22] Kuess [23] and other investigators agree that pulmonary infection is the usual one in childhood. Any extrapulmonary lesions they found which might have been considered as the primary foci usually were thought to have occurred before the lesion of the lung.

Primary Infection.—Certain factors may predispose to the incipiency of pulmonary tuberculosis, namely, paralytic thorax, anemia, undernutrition and local trauma, all of which lower the general immunity. The reaction of the lung in a child is outspoken and exudative; bronchopneumonia develops, the further course of which will be influenced by

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15. Agazzi: Ueber die pathologie der Mittelohrtuberkulose, Monatschr. f. Ohrenh. **48**:676, 1914.

16. Ghon and Terplan: Demonstration eines Falles von primäre Tuberkulose der Regionis vesicalis Nasi, Med. klin. **41**:1072, 1920; Z. Kennt. d. Nasentb., Ztschr. f. Laryngol., Rhinol. **10**:403, 1922.

17. Kudlich, H.: Primary Tuberculosis Infection of Conjunctiva of Eyelids, Ztschr. f. Tuberk. **43**:66, 1925.

18. Ghon (footnote 14, fourth reference).

19. Beitzke: Pathologische Anatomie (Aschoff), Jena: Fischer, 1921, vol. 2, p. 306.

20. Kaufman: Spezielle Pathologische Anatomie, ed. 7, Wissensch. Verlage, Berlin, 1922, vol. 1, p. 356.

21. Aschoff: Ueber die Natürlichen Heilungsvorgänge bei der Lungenphthise, Verhandl. d. deutsch. Gesellsch. f. inn. Med., Vienna, Bergman, 1921, vol. 33, p. 33. Ghon (footnote 14, p. 130); Beitzke (footnote 19, p. 300).

22. Erdheim: Personal communication to the author.

23. Kuess: De l'heredite parasite de la tuberculeuse humaine, Paris, 1898.

the predisposing factors as well as by the virulence of the organism. The exudate may cover a small area and heal; it may extend to varying proportions and then heal, or it may progress rapidly to fatal termination. In children, however, the tendency toward healing is marked; when it occurs there is a rapid sequence of caseation in the bronchopulmonary area, and the process comes to a standstill.

The caseous area dries and becomes smaller; later it calcifies; there is a great tendency to calcification, and in some instances bone with central marrow is produced. If the focus is fairly large, the caseous substance may be extruded through a bronchus or into the pleural sac, leaving a concavity. Surrounding the healing focus a capsule of specific granulation tissue arises which becomes hyaline-fibrous. This capsule is said to be enclosed by another nonspecific capsule.[21] Despite healing, virulent tubercle bacilli may remain within the calcified masses or capsules, which will be a potential source of danger for reactivation. Surrounding the scar there may be atelectatic areas due to compression, or bronchiectatic areas resulting from the fibrous contraction of the healing focus and traction on surrounding bronchioles. When healing does not follow, the tendency to it, however, predominates; there is rapid extension of the bronchopneumonia and caseation, with destruction of relatively large amounts of lung tissue which is extruded, and cavities form. There may be evacuation of caseous tissue and bacilli into the bronchi, the lymphatic channels or blood vessels, leading to disseminated pulmonary or miliary tuberculosis or to meningitis. These conditions are usually fatal, and are known in infants as nursling's phthisis.

Tuberculosis in nurslings is not rare in Europe. In a report of 890 cases of tuberculosis in children, Ghon[24] found that 203, or 22.8 per cent, occurred during the first year of life. Of these, 191, or 94.1 per cent, showed definite primary pulmonary infections; nine were extrapulmonary and three were of questionable origin. Eighty-nine, or 46.6 per cent, showed cavities or caseous infections in cavernous destruction. The cavities are considered primary when the immediate cause is the primary infection; then they merely represent changed primary foci.

They are secondary when they are metastases of the primary infection or are due to a superinfection. More than 75 per cent are primary. The cavities are usually single and the size of hazelnuts. The majority of cadavers of children having such cavities show (in 91 per cent, according to Ghon) evidences of hematogenous infection.

With increasing age, there is a progressively increasing tendency toward chronicity of such destructive lesions.

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24. Ghon, A.: Tuberculosis with Cavities in Infants, Ztschr. f. Tuberk. **43**:3, 1925.

In the majority of cases there is only one focus;[25] more than one occurs less commonly, and more than two rarely. The size varies from that of a pinhead to that of a mandarin orange, but it is agreed by all observers that in healing or in its healed state it usually varies in size from that of a pea to that of a cherry stone. Ghon[26] found more than one third of the lesions in his series (1912 and 1925) to be the size of a pea.

Zarfl[27] reports a case of fresh tuberculous bronchopneumonia in a nursling, aged 23 days. The size of the area of primary infection depends on duration of the condition rather than on the age of the patient. The largest focus is found when caseation and cavitation have progressed most extensively, and the foci are smallest when calcification and shrinking have set in earliest. Any type of healing or progression may be seen at any age. The site of the infection in more than 90 per cent of the cases is directly subpleural or is only a few millimeters away.[28] Adhesive pleuritis was present in almost 50 per cent of the patients in the 1925 series of Ghon,[26] and in 66.3 per cent of the eighty-nine patients showing cavities or caseation in cavernous destruction.

The appearance of the infection at autopsy presents varied stages and degrees of tuberculous bronchopneumonia, caseation, cavitation, healing with calcification and fibrous hyalinization. The reports of various authors show that practically all infections present caseation, and only a small percentage (3 per cent, according to Ghon[18]) show pure scar formation without calcification. The largest number have caseation with or without evidences of healing.

In the region of the primary infection as in that of the diseased regional lymph node, there may arise a nonspecific collateral inflammatory edema, or a so-called gelatinous pneumonia said to be due to the action of tuberculous toxin—nonspecific in the sense that the tubercle bacilli themselves are not present within the area. This may completely heal; if the bacilli enter, however, it may then take the course of a specific process.

DISEASE OF THE REGIONAL LYMPH GLANDS

With the primary infection in the lung is a resultant and almost simultaneous involvement of the regional pulmonary lymph nodes; this constitutes the primary tuberculous complex of Ranke.[29] The infection is

25. Kuess (footnote 23). Ghon (footnote 14). Albrecht, H.: Ueber Tuberkulose des Kindesalters, Wien. klin. Wchnschr. **10**:327, 1909. Engel (footnote 11).

26. Ghon, A.: Ueber Sitz, Grösse, und Form des primären Lungenherdes, Virchows Arch. f. Path. Anat. **254**:734, 1925.

27. Zarfl: Zur Kenntnis des primären tuberkulosen Lungenherdes, Ztschr. f. Kinderh., 1913, vol. 303.

28. Ghon (footnote 26). Kuess (footnote 23). Albrecht (footnote 25, third reference).

29. Ranke: Die Tuberkulose der verschiedenen Lebensalter, München. med. Wchnschr. **39**:2153, 1913; Zur Diagnose der Kindl. Tub., München. med. Wchnschr. **42**:2099, 1914.

conveyed centripetally by the lymphatic channels to the lymph glands in the hilum. The drainage is regional according to the anatomic status of the glands described above, so that, from the location of the pathologic glands, the site of the primary focus may be determined; the gland is the indicator pointing to the primary focus, and, as Parrot [30] stated, the lymph glands at the hilum act as the mirror of the lungs. In this way investigators, such as Ghon,[31] H. Albrecht,[32] E. Albrecht,[33] Parrot,[30] Ranke,[29] Kuess [23] and others, were able to localize the focus.

The lymph glands play the chief rôle in the tuberculous history of the child. The tuberculous inflammation and swelling lymph nodes eventuate in central caseation here as in the primary focus in the lung; there may be immediate extension of varying degree, with either subsidence and healing or extension, of such an intensity that the caseous lymph material and bacilli rupture into the bronchi, lymph glands, blood vessels, pleurae or the mediastinum. The process is more extensive in the lymph nodes than in the primary focus itself. When healing occurs, there is calcification with fibrous hyaline encapsulation. While there is some shrinkage in the size of the glands, they remain enlarged. The involvement of the glands and the intensity of the reaction vary inversely with the age of the patient, so that while a nursling will have a hilum swelling of maximum size, a child of school age will have one of minimum size. According to Engel,[34] there is an inverse relationship as to the intensity and persistence of the swelling between the age of the patient on the one hand, and the susceptibility of the hilum nodes to become involved secondarily so that swollen hilum nodes will occur earlier, be larger and last longer in a nursling, than in a child of school age.

Nodes adjacent to the ones draining the infected area become involved secondarily by extension over the anastomosing channels between the clusters, but the glands are smaller and the pathologic process is of shorter duration and less extensive; this indicates secondary involvement. Simultaneous disease of different groups of the hilum nodes may occur when there is multiple simultaneous infection.[35] At autopsy the glands are usually found to be centrally caseated with varying degrees of cavitation, healing with calcification, shrinkage and fibrous hylanization. A similar pathologic stage is found in the primary focus and regionally infected glands; when variation occurs, so that, for instance, there is cicatrization in the focus in the lung and caseation in the glands without

30. Parrot, in Ghon (footnote 12, p. 3).
31. Ghon (footnote 14, first reference; footnotes 24 and 26).
32. Albrecht (footnote 25, third reference).
33. Albrecht, E.: Thesen zur Frage der menschlichen Tuberkulose Frankf., Ztschr. f. Path. **1**:214, 1907.
34. Engel (footnote 11, page 19).
35. Ghon (footnote 14, p. 101).

cicatrization, this is because in the glandular process there is a newer pathologic change than that in the lung. When there is healing of the focus, there is usually healing of the gland;[36] 30.77 per cent of 169 cases showed caseation in both; 27.8 per cent showed cavitation in the focus and caseation in the gland; the remaining cases showed great similarity in the pathologic process of infection and in the infected gland, also in degree of progression and in evidence of healing.

Infiltrations in the region of tuberculous hilum lymph glands (but also of primary infection) have been described and widely discussed by Eliasberg and Neuland,[37] Wimberger,[38] Bass and Wessler,[39] Kleinschmidt,[40] Wagner,[41] Redeker,[42] Schmitt,[43] Engel,[44] and others. The pathologic status is by no means clear. The process has been variously considered as epituberculous infiltration, paratuberculous, collateral inflammatory edema, gelatinous pneumonia, specific and nonspecific processes and is characterized as a rule by the protracted course of from weeks to months, the benignity, the healing with either no or slight residua, indicating induration and organization, and the presence of the process in children with a positive tuberculin reaction.

Between the primary area of infection and the regional glands the blood vessels are hyperemic, with perivascular new growth of succulent connective tissue[45] which narrows and flattens the mucus filled bronchi. Fibrous tissue replacement is accompanied by shrinkage.

PLEURAL DISEASE

Because the primary focus usually lies subpleurally, it causes a concomitant involvement of the pleurae, as mentioned above. This may manifest itself as an adhesive pleuritis close to the site which shows a traction toward the infection. The pleuritis may be limited to this area or may extend over the entire surface of the lung. The reaction may be fibrinous, serous, hemorrhagic or a combination of these types. The dry fibrin with a little serous exudation is productive of fibrous tissue of

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36. Ghon (footnote 14, p. 107).

37. Eliasberg, H., and Neuland, W.: Epituberculous Infiltration of Lung, Jahrb. f. Kinderh. **93**:88, 1920.

38. Wimberger: Verhandl. d. deutsch. Gesellsch. f. Kinderh., 1924.

39. Bass and Wessler, in Duken: Die Besonderlichkeiten der roentgen thoraxdiagnose im Kindesalter, Jena, 1924, vol. 91.

40. Kleinschmidt: Beitr. z. Klin. d. Tuberk. **61**:330, 1926.

41. Wagner: Mitteil. d. Gesellsch. f. inn. Med. u. Kinderh. in Wien. **19**:364, 1926.

42. Redeker: Uber die exudative Lungeninfiltration, usw., Beitr. z. Klin. d. Tuberk. **59**:588, 1926.

43. Schmitt, W.: Epituberculous Infiltrate, Med. Klin. **22**:548 (April) 1926.

44. Engel: Ueber Paratuberkulose Lungenerkrankungen, Berl. klin. Wchnschr. **42**:877 (Jan.) 1921.

45. Ranke, K. E.: Classification of Stages of Tuberculosis, Deutsches Arch. f. Klin. Med. **129**:224 (June) 1919.

varying density and extent. Miliary tuberculosis over the site may also be seen. Exudation is of varying intensity. Healing occurs with localized or extensive adhesions; the process, however, may be so widespread as to lead to synechiae of the pleurae. If a caseous focus perforates the pleural cavity, a caseous pleuritis will result; in such instances healing may be accompanied by calcification and even by ossification. The condition usually found is a localized fibrinous pleurisy. The miliary process or the inward traction over the site at autopsy calls attention to the localization of the primary focus. Because of their location near the pleurae, the lymph glands may cause pleurisy of the mediastinum and interlobar fissures.

ROENTGENOLOGIC DIAGNOSIS

The roentgenologic diagnosis of primary tuberculosis may be made fluoroscopically or by the roentgen ray. It is preferable to make both diagnoses, but when large numbers of patients are involved and when strict economy is indispensable fluoroscopic examinations only are necessary. Fleischner [46] has called the reading of the roentgenogram, without preliminary or subsequent fluoroscopy, blind roentgenology, and it may be added further that a fluoroscopic examination only is equally blind. The superiority of the roentgenogram for registration of fine shadows, nice differential points and other observations, besides the advantage of permanent record, needs no elaboration and has been acknowledged by most authors.[47]

Fluoroscopic examination permits a study of the respiratory movements (diaphragm, lungs, etc.) in varying positions, with aids such as coughing, sniffing and forced breathing, in such a manner as to give a conception of the thorax with its contents as a unit, which one roentgenogram or even several does not give. The examination of the interlobar fissures during varying lordotic positions, and of the sagittal, frontal and transverse positions as the patient completes circumference of movements, is without question an essential part of the roentgenologic examination of the thorax which only fluoroscopy allows.

For the diagnosis of the primary complex, the fluoroscope is of particular value, since the pleurae, lung fields, mediastinum and hila, the diaphragm and the interlobar fissures can be examined in a great many planes, thus allowing a fairly definite lobar localization. In the vast amount of literature on primary tuberculosis, I have encountered the statement repeatedly that the roentgenologic diagnosis of the primary infection is attended by the greatest difficulties; while it is true that such a diagnosis is difficult, the statement seems exaggerated; the

46. Fleischner (footnote 4, p. 188).

47. Jaches: Personal communication to the author. Assman: Klin. Roentgendiagnose Vogel, Leipzig, 1922, p. 189.

trouble is caused not so much by the difficulty inherent in the diagnosis as by indiscriminate and careless diagnosing. Certain definite signs must be present for a roentgenologic diagnosis, namely: (1) A positive tuberculin skin reaction; (2) the primary area of infection; (3) disease of the regional hilum gland; (4) evidences of lymphatic connection between the primary focus and regional hilum gland and of pleuritic involvement, which are helpful but not essential for a positive diagnosis.

The primary area of infection may be considered in the beginning stage, the progressive stage and the healing or healed stage.

In the beginning stage there may be no shadow, if the area involved is small; if the area is larger, a shadow is seen which cannot be differentiated from one caused by ordinary pneumonia. This area might be the size of a walnut or it might be extensive, involving the entire lobe. At this stage there is nothing peculiar or characteristic that differentiates the condition roentgenologically from an ordinary exudative bronchopneumonia. If the process has advanced from central caseation to cavitation, a picture may be present in which the areas of diminished density in this shadow may cause one to suspect a tuberculous process, but even that may not be different from pneumonia which has progressed to abscess or gangrene formation with evacuation. The greater part of the shadow of the primary focus may be due to the collateral inflammatory edema or gelatinous pneumonia which may cause a wide extension of the area of involvement. When this clears up, the relatively small area of infection which it has concealed becomes evident.

In this, as in every roentgen-ray interpretation, a proper diagnosis cannot be made without consideration of the clinical history and picture. When healing has commenced, the primary focus becomes a more definitely recognized entity. The caseation and fibrous tissue will produce a dense shadow more or less sharply circumscribed. With calcification, a maximum (calcium) density is produced which is circumscribed and sharply set off from the lung field. The size of the primary focus as seen will depend chiefly on the extent of caseation and calcification, so that even a large focus inspissated with only small amounts of calcium and only slightly caseated may appear as a small focus. Because of irregular or not uniform calcification, it may present the shadow of a multispotted area or cluster which does not necessarily mean multiple foci in one region. The primary focus is usually recognized as such, and is seen as an area of calcium the size of a pea, with a sharply circumscribed density; it is stellate, circular or oval, its margin irregular or smooth and stands in a clear lung field (figs. 2, 3 and 4).

Although the primary infection can be recognized roentgenologically without a similar recognition of diseased regional lymph glands, a diagnosis of the primary tuberculous focus without recognition of its association with the diseased glands should not be made. In the past,

the erroneous and too frequent diagnosis of hilum tuberculosis has led to confusion, and has created suspicion of the value and competence of such a diagnosis. There has been also the indiscriminate interchange of the terms hilum gland tuberculosis and hilum tuberculosis, which differ from one another in conveying a conception of the pathogenesis of

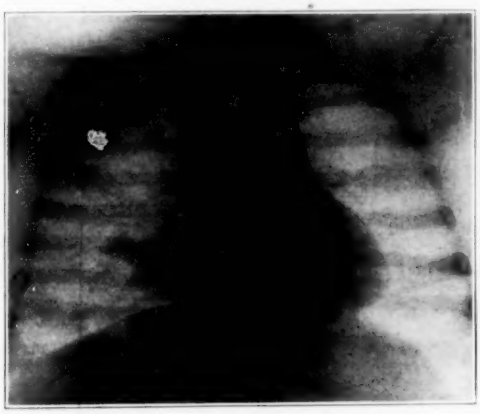

Fig. 2.—Healing in a tuberculous girl, aged 8 months, with a positive tuberculin reaction, showing paramediastinal stringlike shadow at the right base, in November, 1920.

Fig. 3.—Same patient as in figure 2, in June, 1921 (seven months later). On the site of the shadow, there is an extensive, soft cloudiness; a broad shadow containing circumscribed areas (small) of diminished density extends from the right hilum toward the apex.

tuberculosis of the lung. Tuberculosis of the hilum gland is understood to be a tuberculous disease of the glands of the hilum secondary to infection of a site in the lung to which they are regionally related.

The infection is carried centripetally by the lymphatics from the primary focus to its regional lymph glands. The infection of the lung

is thus primary and that of the lymph gland secondary. When hilum tuberculosis was discussed in the past, it was often understood to be a tuberculous disease of the lymph glands of the hilum which was not necessarily secondary to a focus in the lung; in fact, it was assumed that

Fig. 4.—The same patient as in figures 2 and 3, September, 1924 (three years and three months after figure 3 was taken). On the site of the basal shadow seen four years previously (fig. 2), there is a distinctly circumscribed spot the size of a lentil, and of calcium density. In the shadow of the mediastinum, which is drawn to the right, can be seen a longish, calcified, paratracheal gland shadow.

Fig. 5.—The development of a primary focus in a girl, aged 7 years, in June, 1921. At the right base there is a circumscribed primary focus, the size of a bean. Between this and the right hilum, which shows increased density, there are coarse, stringlike shadows.

the infection might travel in centrifugal fashion retrograde from the glands to the lung tissue secondarily. Such a contention for primary pulmonary tuberculous infection has found no experimental [8] or pathologic evidence [48] and generally has been discarded.

48. Ghon (footnote 14, p. 108).

Tuberculosis is not the only pathologic condition that causes an enlargement of the bronchial lymph glands (bronchitides, pneumonia, particularly influenza, measles, pertussis, leukemia, lymphogranulomas, etc.). When the glands are normal they do not cast a shadow. At the

Fig. 6.—The same patient as in figure 5, in December, 1921 (seven months after the first roentgenogram). The primary focus has become smaller and denser through shrinkage; the hilum shadow also shows a more distinct structure.

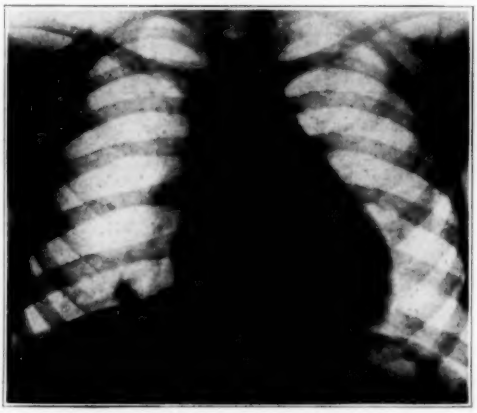

Fig. 7.—The same patient as in figures 5 and 6, March, 1924 (two years and ten months after figure 5 was taken). Further healing and increasing calcification of the primary focus of infection have occurred.

normal hilum, however, a shadow may be seen which is caused by the superimposition and summation of shadows caused by the blood vessels and bronchi. Some observers have considered that this shadow was caused by the bronchi chiefly, and others have thought that it was due

to the blood vessels. Assman,[49] Gräff and Küpferle [50] and Max Cohn [51] have offered evidence that points to the predominating part played by the blood vessels, a secondary lesser influence being that of the bronchi. The shadow is then produced by a summation of both. Normal glands have too poor an absorbing power of the roentgen rays to cast a shadow. Inflammation and swelling with enlargement and usually with increased density of the mass, as in bronchopneumonia, influenza, etc., will produce a shadow. Fibrous indurated nodes can give more or less sharply demarcated dense shadows. The blood vessels create solid, gradually narrowing shadow stripes. The bronchi are seen as lumina enclosed by fine shadow stripes indicating the walls of the bronchi. The left hilum shadow is somewhat higher than the right, because the

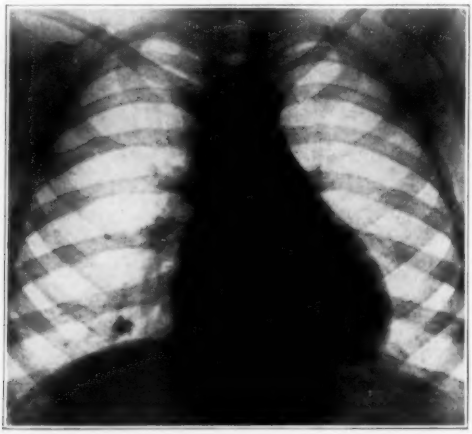

Fig. 8.—Same patient as in figures 5, 6 and 7, September, 1924 (three years and four months after figure 5 was taken). Both the primary focus and the regional hilum glands show dense calcification.

left pulmonary artery lies more toward the cranium. The pulsations seen at the hilum show the presence of the arteries.

Veins usually are not seen because of their thin walls, early branching and shortness. The lymph vessels are too fine to cast a shadow, but with the veins participate in the production of a summate shadow. Cross-sections of the bronchi are often seen as circumscribed rings.

Tuberculous hilum glands cannot be accurately diagnosed. Often diagnosis is subjective. In the sagittal fluoroscopic examination, the glands at the tracheal bifurcation may not be seen because of their position in the mediastinum and behind the heart shadow, but sometimes

49. Assman (footnote 45, p. 194).

50. Gräff, S., and Küpferle, L.: Die Lungenphthise, Berlin: Julius Springer, 1923, vol. 6, p. 236.

51. Cohn, Max: Die Lungentuberkulose im Roentgenbilde, Tub. Biblio. **2**:14, 1923.

they may be seen with harder rays (fig. 2). In the oblique diameters, notwithstanding the difficulty in evaluating the shadows, the pathologic glands may be recognized. The paratracheal glands may be seen when they are large enough to override the middle shadow. The bronchopulmonary glands are seen better because they are lateral to the bronchi and lie more deeply in the tissue of the lung. They are seen in the free lung field and particularly on the right side where the heart shadow lies less laterally than on the left side. Because of the close proximity of the glands to the pulmonary artery, the differentiation of limitation of each often is not possible.

The normal hilum shadow, which is cast mainly by the pulmonary artery and secondarily by the bronchi, the veins and the lymphatic channels, appears as a faintly dense shadow, which rapidly loses its intensity

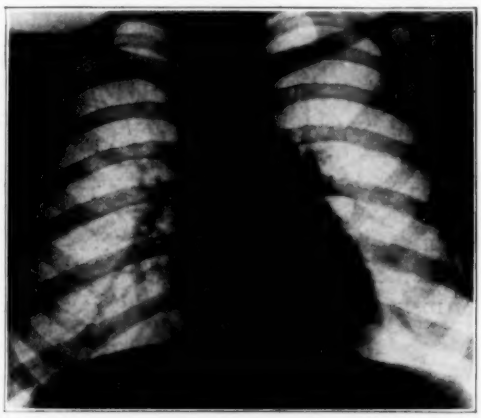

Fig. 9.—Typical picture of a calcified primary infection. The primary focus lies in the upper lobe near the thoracic wall. There is a calcified shadow the shape of a bean at the left hilum (regional lymph gland).

as it extends laterally, with an indefinitely circumscribed margination fading into the lung field, and shows stripes of vessels and bronchi or their cross-sections. In emphysema or in congestion of the lungs as in cardiac decompensation, it may appear denser and larger. Wimberger,[52] Assman,[53] Kretschmer,[54] Rach,[55] Wessler and Jaches,[56] Sluka[57] and

52. Wimberger, H.: Roentgen diagnose der Brust bei Kinder. Tuberkulose, Monatschr. f. Kinderh. **29**:413, 1923.

53. Assman (footnote 47, second reference).

54. Kretchmer: Die Roentgendiagnose der Kindlichen Brust., Fortschr. a. d. Geb. d. Röntgenstrahlen **28**:452, 1921.

55. Rach: Radiologische Klinische semiotik d. Kindl. Lungerkrankungen, Ztschr. f. Kinderh. **15**:33, 1917.

56. Wessler and Jaches: Clinical Roentgenograms of Diseases of the Chest, Albany, N. Y.: the Southworth Company, 1923.

57. Sluka: Die Hilustuberbukolse des Kindes im Roentgenbild, Wien. klin. Wchnschr., 1912, vol. 7.

others present roentgenologic evidence of a tuberculous hilum of more or less uniformly increased density with a shadow that is circumscribed and with a relatively sharp outline which shows arching and notching, projecting laterally into the lung fields (fig. 9). The picture may not always so appear this way. The region of the hilum may present a hazy appearance of increased density spotted with dense shadows of irregular, sharp contour and varying size. This would represent an older process in a further advanced stage of healing (contraction, induration and calcification).

The left side is more difficult to evaluate. Here an enlargement must be marked to be seen; it may be present between the aortic knob and the auricular shadow. Pulsation may be transmitted.

The roentgenologic picture of the so-called epituberculous infiltration considered in the foregoing presents a unilateral or bilateral shadow of homogeneous density and varied size, extending outward from the region of the hilum. The shadow in itself does not differ from that of ordinary pneumonia. Its prolonged persistence, the localization and the healing with, as a rule, no residue, with enlarged hilum nodes becoming visible, the benign course, in children with a positive tuberculin reaction suggest the so-called epituberculous infiltration. I have not recorded such cases in the statistics given in this paper, since the nature of such an involvement cannot be determined from a single visit and one fluoroscopy. It becomes of immediate importance in my figures, since such infiltrations may conceal or harbor an infection and enlarge the hilum shadow.

The predominating number of attacks of pleurisy in children are tuberculous. Pleurisy, depending on its site, will be costal, diaphragmatic, mediastinal, interlobar or any combination of these. The roentgen-ray diagnosis of these is of great aid to the clinician, who by clinical means is frequently unable to detect pleuritic pathologic changes, particularly in interlobar processes (fig. 10).

The discussion of the roentgenologic recognition of pleurisy is extensive, and I shall touch on it only as far as it concerns primary tuberculosis. Depending on whether the pleurisy is exudative or productive, its age, its extent and its location, the evidences of its presence will vary. Small amounts of fluid may cast no perceptible shadow. A fine, thin shadow, hugging the wall of the costal thorax and reaching the apex, has been described by Fleischner,[58] as expressing a thin layer of exudate. Moderate amounts of exudation displace the lowest lobe upward, and cause a more or less triangular shadow with its base at the diaphragm, one wall being the costal surface of the thorax, the other a concavity with its apex reaching various heights in the axilla. The fluid may be so

58. Fleischner (footnote 4, page 196).

extensive as to compress all lobes and cause a displacement of the heart, the shadow covering the entire lung and being continuous with the displaced mediastinal shadow. Mediastinal pleuritis, with an encapsulated exudate between the mediastinum and the pulmonary pleurae, may be considered as pure mediastinal or anterior and posterior costomediastinal.[59]

The anterior costomediastinal pleuritis causes a so-called double contour of the heart shadow on the right—a triangle with its apex upward and its base on the diaphragm. On the left there is a double contour and a broadening of the mediastinal shadow. In posterior costomediastinal pleuritis there is a bandlike shadow parallel to the spine, which must be differentiated from that caused by a sinking abscess of

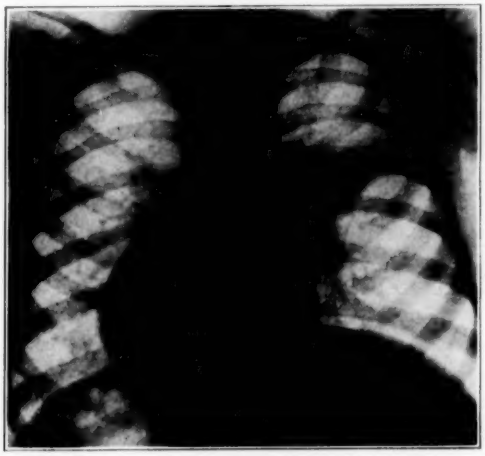

Fig. 10.—A primary focus with the interlobar (adhesive) pleurisy. At the right hilum there is a dense, irregular stringy shadow from which a stripelike shadow extends upward and outward. Beneath and near the thoracic wall there is a circumscribed primary focus the size of a bean.

the spine. Pure mediastinal pleuritis is frequently associated with interlobar pleurisy, particularly between the middle and lower lobes. It is a dense mediastinal shadow, and its shape—triangular, wing or spur—will vary with the extent of the concomitant interlobar involvement and the fluoroscopic position in which it is observed. Assman [60] believes that interlobar exudates are not common. The experience of Wimberger and myself is that interlobar shadows—whether they are areas of thickening or exudates it is hard to say—are not uncommon and are to be seen daily in every active fluoroscopic children's service.

59. Herrenheiser: Costo Mediastinal Schwarten, Fortsch. a. d. Geb. d. Röntgenstrahlen **30**:165, 1923.

60. Assman (footnote 45, page 327).

The pleuritic involvement of the fissure between the right upper and middle lobes manifests itself easily roentgenologically, for in a sagittal fluoroscopy or in the usual sagittal roentgenogram, the rays are parallel to the larger part of the fissure and pass through its depths, so that a horizontal shadow, a thin line or band, is seen. According to

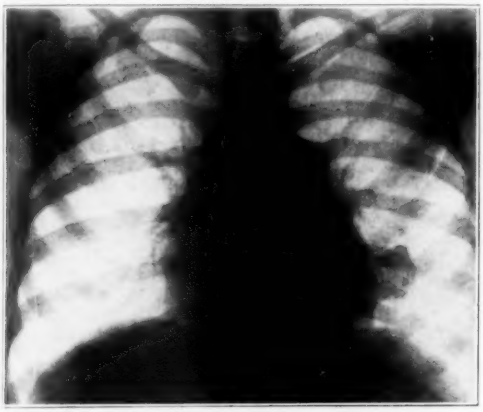

Fig. 11.—Example of a calcified primary focus the size of a hazel-nut, lying near the left ventricle with calcified regional hilum glands.

Fig. 12.—Interlobar pleurisy (illustrating the value of examination in the lordotic position). Paramediastinal, netlike structure is present on both sides, most dense at the hilum with faint cloudiness of the inner part of the lungs.

Fleischner,[61] a band or spindle formed shadow with sharply marginated borders represents an exudate. A stringlike shadow represents a thin exudate or induration, according to Eisler,[62] who first described

61. Fleischner (footnote 4, page 196).

62. Eisler: Interlobar pleuritische Schwarte der Kindlichen lunge im Roentgenbilde, München. med. Wchnschr. **35**:10, 1912.

the roentgenologic recognition of interlobar pleuritic processes. This may be continuous with the mediastinal shadow, as stated in the foregoing.

Recognition of the involvement of the other two fissures necessitates consideration of the anatomy as given in the foregoing, and a consequent movement of the tube, as shown early by Holzknecht [63] and

Fig. 13.—Lordotic position of same patient as in figure 12 taken at the same time, showing that the bilateral faint cloudiness in figure 12 was due to the interlobar thickening in both great interlobar fissures.

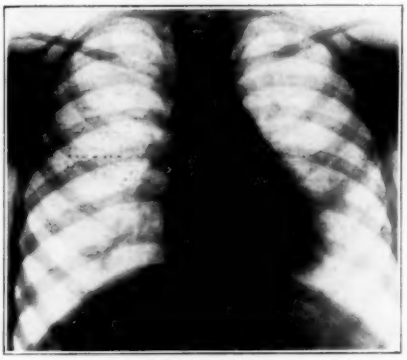

Fig. 14.—Pericardiopleural adhesion (illustrating the value of examination in the lordotic position). The heart shadow appears somewhat displaced toward the left, and its apex has an irregular, fringelike margin. A broad, soft shadow of indistinct outline extends from the heart to the thoracic wall.

others, or having the patient in the lordotic position of Fleischner and rotating him through a complete circle so that frontal, sagittal and oblique views are seen. Sagittal fluoroscopy may fail completely to reveal an interlobar process in the great fissures, since the rays pass

63. Holzknecht: Die Roentgen Diagnostik der Erkrankengungen der Brusteingeweide, Hamburg, 1901.

through the smallest depth of the interlobar fissure. Occasionally a haziness of the lung field will be seen, which suggests the possibility of a thin exudate between the lobes. It is only when the varied positions are taken that interlobar pathologic changes will be revealed, as emphasized by Wimberger.[64] For children and infants the method of choice in examinations becomes the lordotic position. In every fluoroscopic examination I have made it a practice as a routine to take a picture with the patient in the lordotic position, and frequently unsuspected pathologic changes have been revealed. A haziness or a hazily outlined shadow will become a sharply defined triangle with its base toward the hilum and its apex lateralward (figs. 12 and 13). Most of the interlobar shadows are seen in the usual anatomic fields, but because of variations which must be borne in mind they may be seen in varying positions. Frontal fluoroscopy with the movement of the patient and the

Fig. 15.—The lordotic position reveals the shadow in figure 14 as a pericardiopleural adhesion; that is, an adhesion between the pericardium and the interlobar pleura with shrinkage or contraction.

tube will reveal linelike, bandlike or biconvex shadows of the entire extent or, more usually, of a partial extent of the interlobar course. This may be combined with a shadow of mediastinal pleurisy, or on the right side with pleurisy of the small interlobar fissure. Small triangular or irregularly shaped shadows on the diaphragm may represent an adjacent interlobar exudation or adhesion.

STATISTICS

With the foregoing as the criterion for the diagnosis of a primary tuberculosis, the statistics of 6,329 fluoroscopies may now be discussed. The manner in which the statistics were compiled is as follows:

Records of 41,000 consecutive cases were examined, and the patients on whom fluoroscopies were made were considered. For each year from

64. Wimberger: Technische Erfahrungen aus der Kinderroentgenographie. Fortsch. a. d. Geb. d. Röntgenstrahlen **24**:96, 1922.

1921 to 1924, inclusive, a separate table was drawn, and in each one there were fourteen columns, one for each year of life. Under these columns were recorded the sex, tuberculin reaction, primary single infection or primary multiple infections, localization or nonlocalization, lymph gland disease and localization and complications. The totals for each year were obtained, percentages were estimated, and the average totals and average percentages for the entire four years were compiled.

The total number of fluoroscopies was 6,329; of these 3,221, or 50.9 per cent, were in boys and 3,108, or 49.1 per cent, were in girls. There were 584 single primary infections, or 9.27 per cent, and twenty-seven multiple infections, or 0.42 per cent. The total number of primary infections was 611, or 9.65 per cent.

Ballin [65] reports that in a series of 2,500 roentgenograms, principally of adults, he found 5.6 per cent with primary infection (calcium). This percentage, 9.65 for 6,329 fluoroscopies, is lower than the one here reported, and may be due to the fact that the figures are chiefly for adults and estimated from roentgenograms. It has been my experience that fluoroscopy permits a more frequent diagnosis of the primary infection than does the roentgenogram, for the reasons previously mentioned; that is, movements of the diaphragm and ribs and varied positions, so that an infection which might be concealed in the diaphragmatic or rib shadow is revealed by the fluoroscope. Furthermore, it is a fact that as the primary focus becomes older it becomes smaller, so that in the lung of an adult it is relatively smaller, which makes its visualization even more difficult.

The localization was made according to lobes. Gräff and Küpferle [66] discussed examinations of the lung in terms of upper, middle and lower lung fields. When fluoroscopy is performed or pictures are interpreted following fluoroscopy, localization into lobes is possible and preferable, and I see no particular advantage of speaking in terms of lung fields.

For 1921, 1923 and 1924, the order of single primary focus incidence was: (1) right lower lobe; (2) right upper lobe; (3) left lower lobe; (4) left upper lobe, and (5) right middle lobe. For 1922, the right middle lobe lesions outnumbered those of the left upper lobe. The average for the four years was: right lower lobe, 167, or 28.6 per cent; right upper lobe, 118, or 20.2 per cent; left lower lobe, 99, or 16.9 per cent; left upper lobe, 71, or 12.1 per cent; right middle lobe, 69, or 11.8 per cent. The right side predominated over the left, 380, or 65.1 per cent for the right and 204, or 34.9 per cent for the left. Sixty cases, or 10.3 per cent, were not recorded as right or left, for, owing to some error, indistinctness or abbreviation, a lobar localization could not be

65. Ballin: Der tuberkulose primär Komplex im Roentgenbild der Lunge, Beitr. z. Klin. d. Tuberk. **51**:127, 1922.

66. Gräff and Küpferle (footnote 50, page 9).

understood. The lower lobes predominated over the upper lobes thus: 266, or 45.56 per cent, to 189, or 32.35 per cent, and the middle lobe, 69, or 11.81 per cent (fig. 16).

This localization is interesting to compare with that of other observers. Ghon [67] (1912 and 1925) and Schürman [68] found on postmortem examination that the lesion was more frequently on the right side than on the left, and that more infections occurred in the upper than in the lower lobes. Lange, too, found more on the right than on

TABLE 1.—*Localizations of the Primary Focus*

	Number of Cases	Number of Infections								
		Right					Left			
		Upper	Middle	Lower	Non-local	Total	Upper	Lower	Non-local	Total
1926. Stoloff:										
One infection	584	118	69	167	26	380	71	99	34	204
Percentage	...	20.2	11.8	28.6	..	...	12.1	16.9		
1912. Ghon:										
One infection	142	44	11	32	..	87	33	22	..	55
Percentage	...	30.98	7.75	22.54	..	...	23.24	15.49		
One and more infections	170	57	14	39	..	110	50	40	..	90
Percentage	...	28.50	7.00	19.50	..	...	25.00	20.00		
1913. Lange:										
One and more infections	170	41	11	39	..	91	43	36	..	79
Percentage	...	24.12	6.47	22.94	..	...	25.29	21.18		
1925. Ghon:										
One infection	100	28	8	16	..	52	26	22	..	48
Percentage	...	28.00	8.00	16.00	..	...	26.00	22.00		
1926. Schürman:										
One infection	648	183	41	126	..	350	170	128	..	298
Percentage	...	28.24	6.32	19.44	..	...	26.23	19.75		

TABLE 2.—*Localization of the Primary Focus in Author's Cases*

	Number	Percentage
Right lung	380	65.1
Left lung	204	34.9
Lower lobes	266	45.5
Upper lobes	189	32.3
Middle lobe	69	11.8
Nonlocalized lobe	60	10.3

the left and more in the upper than in the lower lobes, but more in the left upper than in the right upper lobe (tables 1 and 2 and fig. 17). Kuess [23] found them as frequently on the left as on the right, and more frequently in the lower lobes. Roentgenologically, Assman [69] has observed them more frequently in lower parts of the lung; Simon [70] found them in the right more than in the left and more in the right upper lobe; Sperling [71] observed them mostly in the right upper lobe.

67. Ghon (footnotes 14 and 26).

68. Schürman: Der Primärkomplex Rank., Virchows Arch. f. path. Anat. **260**:799, 1926.

69. Assman (footnote 47, second reference, page 295).

70. Simon: Zur Klinik des primären Komplexes, Ztschr. f. Tuberk. **34**: 345-354.

71. Sperling: Die Lokalizations Diagnose der Lungentuberkulose im Kindesalter Mittels d. Roentstr, Dissert, Berlin, 1920.

Enlargement of the hilum gland on the same side as the infection was found in 423, or 72.52 per cent, of the subjects with single primary infection. In 107, or 25.2 per cent, of the cases, enlargement of the hilum gland was visible on the opposite side. This extension was noted

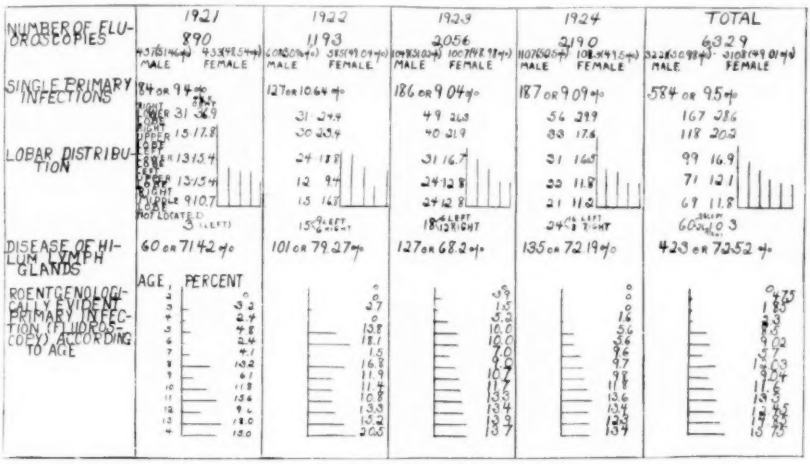

Fig. 16.—Localization of primary focus for years 1921 to 1924, inclusive.

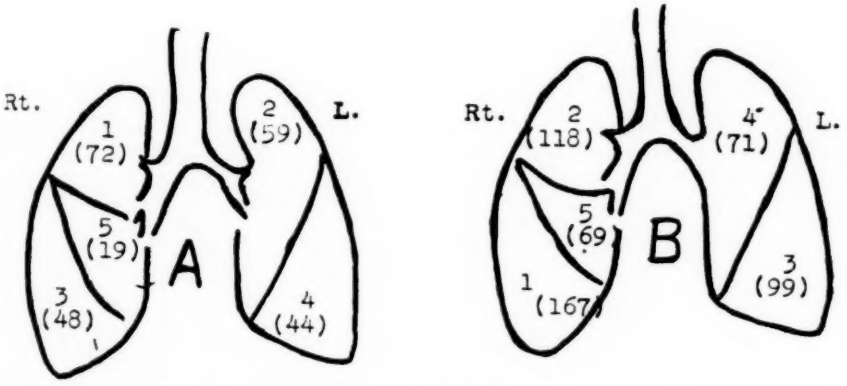

Fig. 17.—Comparative distribution of single primary infections: *A*, that described by Ghon, 1912 and 1925 (pathologic); *B*, that reported by Stoloff, 1926 (fluoroscopic).

in gross numbers more frequently from right to left than from left to right; but since the total number of involvements of the right and left side of the hilum is as 275 is to 148, and of extensions as 71 is to 36, the extension from right to left and from left to right was found to occur, practically speaking, equally often; namely, 1 : 538 to 1 : 507.

The youngest patients who revealed a primary focus of infection in the lungs on fluoroscopy were in the second year of life. None were recognized in the first year. It is true that some of the nurslings may have shown a primary focus as a pneumonic shadow or cavitation which was not recorded because of confusion of specific and nonspecific processes. As stated in the foregoing, Zarfl [27] has reported primary infection in a child less than 1 month old. After the second year and until the fourteenth year, I found an increasing age percentage, that is, a higher percentage of infections for the age class. It is interesting that curves for the individual years show peculiar variations. For instance, in 1922, in the second year there was an age percentage of 0; in the third year, 2.7 per cent; in the fourth year, 0; in the fifth year, 13.8 per cent; in the sixth year, 18.1 per cent, and in the seventh year, 1.5 per cent. After that the percentages increased. This points to the great possibility of error in deducing results from small series. The four years average, however, shows a curve which rises, though not uniformly, from 0 in the first year of life, and 0.975 per cent in the second year to 15.75 per cent in the fourteenth year (fig. 16).

Multiple Foci.—In twenty-seven children, or 4.2 per cent, more than one shadow of infection was noted. Only four, or 14.6 per cent, of the twenty-seven had three distinct shadows; twenty-three, or 85 per cent plus, had two shadows; seventeen, or 63 per cent, of the twenty-seven had multiple shadows within such a small radius of each other that the question arose as to whether they could not be parts of a single infection of large extent. Ghon [72] mentions the difficulty of determining at times whether adjacent infections are really multiple or parts of one infection. Demonstrable and associated disease of the hilum gland was present in 85.2 per cent of the cases. Multiple foci showed preference for the lower lobes, almost as frequently in the right lung as in the left. Lange found that in twelve, or 7.06 per cent, of his cases multiple foci occurred, and Ghon [73] found them in twenty-eight, or 16.47 per cent.

Pleural involvement was noted in only thirty cases, or 0.05 per cent; sixteen, or 53.3 per cent, of these were interlobar, and fourteen, or 46.7 per cent, adhesions. The former were seen as congestions.

As a routine, each child was tested with tuberculin. A Pirquet test was first made, and the parent was requested to return the child for interpretations. When the Pirquet test was negative twenty-four and forty-eight hours later, an intracutaneous test (Mantoux) was made, first with 0.1 mg. of old tuberculin, and if that proved negative after twenty-four hours, 1 mg. was used. The results were then reported as tuberculin test, positive; Pirquet test, negative with no subsequent

72. Ghon (footnote 14, p. 42).

73. Ghon (footnote 26, p. 740).

Mantoux test; tuberculin test, definitely negative; the reactions in other children were not recorded owing to the failure of the child to return, as is so often the case in outpatient departments.

The total number of children with definitely positive tuberculin reactions was 4,494, or 71.02 per cent; definitely negative Pirquet and Mantoux tests, 253, or 3.8 per cent. There were 665 children, or 10.6 per cent, who gave negative Pirquet reactions but had no further tests made (table 3).

TABLE 3.—*Results of Pirquet and Mantoux Tests in Children*

	1921		1922		1923		1924			
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Total	Average Per Cent
Tuberculin test positive	633	71.1	861	72.1	1,491	72	1,509	68.9	4,494	71.02
Tuberculin test negative	24	2.6	51	4.2	127	6.1	51	2.3	253	3.8
Piquet test negative, Mantoux test not made	95	10.6	142	11.9	132	6.4	296	13.5	665	10.6
Not recorded	138	16.0	139	11.8	306	15.5	334	15.3	917	14.6
Total cases in which fluoroscopy was performed	890		1,193		2,056		2,190		6 329	

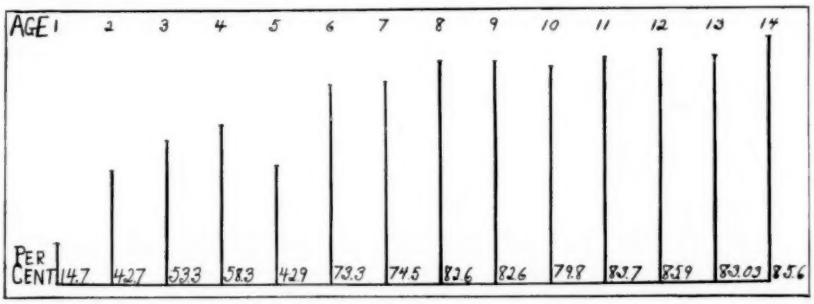

Fig. 18.—Patients with positive tuberculin reactions from 1921 to 1924, showing the average percentage according to age.

COMMENT AND CONCLUSIONS

The divergence of results of pathologic observations concerning the primary infection in tuberculosis, as cited in the foregoing, and those of this series is striking. Ghon, frequently cited, who has studied the subject exhaustively, has found the primary focus of infection to be pulmonary in more than 95 per cent of his cases; and an associated tuberculous involvement of the bronchial glands was practically always present. These patients all gave positive tuberculin reactions. All my patients with an evident primary infection or a primary focus, seen by the roentgenogram, gave positive tuberculin reactions. Of the 6,329 fluoroscopies, only 9.5 per cent showed a primary focus of infection.

Of the 4,494, or 71.02 per cent, subjects giving a definitely positive tuberculin reaction, only 584, or 12.9 per cent, showed a definite primary infection or focus on fluoroscopy. There is, then, a great discrepancy, 58.12 per cent, which would probably be greater if the tuberculin tests were completed, since only 3.8 per cent were definitely negative. Practically speaking, all primary infections are pulmonary. It must be inferred, then, that the primary infection or focus is present, but not evident as such roentgenologically. When a shadow that is not different from an ordinary pneumonic one is seen, or when caseation, induration or calcification were present but so minimal as to escape fluoroscopic projection, the area of infection naturally could not be recognized. The difficulty that Ghon had in finding the primary infection macroscopically and on palpation, the many long hours during which he searched and frequently missed the focus of infection only to find it at a subsequent time and on further tireless examination, make it clear how easily it may be missed in roentgenograms, particularly in fluoroscopies, when for physical reasons or because of the minuteness of the area of infection, such a shadow or focus of infection escapes observation.

A pleuritic process, an adhesion or an interlobar process opposite a pathologic hilum showing enlargement or increased density may mean a primary focus of infection, but the large number of other single or combined conditions which may also produce such a picture necessarily precludes such a basis for diagnosis. A definitely dense shadow (calcium or caseous density), sharply circumscribed in the lung field, irregular or regular in contour and usually the size of a pea, in a child with a positive tuberculin reaction may be considered as a primary focus. When a large, dense hilum shadow without the presence of a definite regional primary focus is considered a tuberculous disease of the lymph gland, the diagnosis is uncertain, for many pathologic conditions will produce such a picture (postinfectious diseases, measles, grip, leukemia, Hodgkins' disease, etc.). To diagnose tuberculous disease of the lymph glands roentgenologically, three factors are essential: (1) A patient with a positive tuberculin reaction; (2) a primary focus; (3) a pathologic hilum or disease of the hilum gland. Adhesions, interlobar processes, lymphangitides and increased markings between the primary focus and the hilum are helpful but are not essential. Notwithstanding the association of pathologic changes in the tracheobronchial lymph nodes with that of the primary focus, and which is more extensive than the primary focus, only 72.52 per cent of the single foci or 73.8 per cent of the single and multiple foci are found evident roentgenologically. Here, too, it must be said that a not inconsiderable number of pathologic hila, more than 25 per cent in this series, are not recognized fluoroscopically. This may be due to the superimposition of the heart shadow

and the failure to delimit the pathologic glands in any of the positions; or, too, it may be that the calcification, caseation or induration fail to produce a shadow distinct enough to be recognized.

In only 0.05 per cent, or thirty cases, did I find pleuritic involvement, whereas in pathologic reports there is evidence of pleuritic involvement in more than 90 per cent of the cases, half of which were found to be adhesive pleuritides by Ghon. This can readily be understood, for the majority of these pleuritic processes are limited to small areas superficial to the area of infection, which are fibrinous and serofibrinous, and which usually are so small as to be missed by the roentgen ray. If the exudation is large, it may obscure the focus of infection and its association with it, and though it may be assumed to be tuberculous, for statistical purposes it cannot be counted as such. In this series of fluoroscopies, many cases of pleurisy were encountered just as were some cavities the tuberculous nature of which was probable, but which were not so counted owing to the failure to detect the presence of the primary focus of infection.

TABLE 4.—*Comparative Observations on Children with Positive Tuberculin Reactions*

	Stoloff, Percentage	Hamburger and Monti	Barchetti
First year	14.7	1	1
Second year	42.7	9	6
Third to fourth year	50.6	27	17
Fifth to sixth year	73.9	51	30
Seventh to tenth year	82.2	71	37
Eleventh to fourteenth year	84.8	94	58
	Vienna	Vienna	Graz

I cannot emphasize too strongly and reiterate too often the importance of making fluoroscopies in more than one diameter for the study of the tracheal bifurcation and retrocardiac space, as well as for the vessels, spine, esophagus, etc., and of utilizing the lordotic position in infants. In infants, it has been found a great help to use the chair devised by Wimberger [64] which insures a steady position.

The results of testing 6,329 children with tuberculin for the four years, though not complete because of the difficulties mentioned, are interesting in comparison with those of Hamburger and Monti,[74] for Viennese children in 1909, and also those of Barchetti [75] for children in Graz (table 4 and figs. 16 and 18).

The figures of Hamburger and Monti and of this series show a variation, particularly in the first ten years of life. The figures in my series are always higher except in the 11 to 14 years division. Barchetti's

74. Hamburger and Monti: Die tuberkulose Häufigkeit im Kindesalter, München. med. Wchnschr. **9**:449, 1909.

75. Barcheti, in Hamburger, Pfaundler and Schlossman: Handb. d. Kindhlk., Leipzig, F. C. W. Vogel, 1924, vol. 2, p. 601.

statistisics for Graz are much lower than those of Hamburger and Monti for Vienna and mine. The figures of Hamburger and Monti are those for the general population of children before the war; mine are postwar figures, and represent the results of tests in a clinic for sick children. This probably accounts for the average increased percentage.

SUMMARY

A discussion of the primary infection of tuberculosis in the child is presented, with particular reference to the results obtained in a statistical analysis of 6,329 fluoroscopies made in the outpatient department of the University of Vienna Kinderklinik.

To insure a proper roentgenologic recognition of the primary infection, the anatomy of the lungs and of the pulmonary lymph gland system is described.

The pathologic change and pathogenesis of the primary pulmonary infection, the adjacent pleuritic involvement and the associated disease of the regional lymph glands are described.

On the basis of the preceding pathogenic definition, the roentgenologic diagnosis of the primary infection is made, and statistics are compiled.

In the beginning the primary focus may not be recognized as such. In the healed stage it is seen as an area of varying size, usually the size of a pea, and of calcium density; it is sharply circumscribed, stellate, circular or oval, with an irregular or smooth margin; it is usually of a homogenous consistency, but at times it may be spotted, standing in a clear lung field.

Normal hilum glands do not cast a shadow. A shadow in the region of the hilum caused by enlargement or disease of the bronchial lymph gland is not necessarily tuberculous. It may be assumed to be tuberculous: (1) when a primary focus of infection is recognized in the region that it drains; (2) when it presents a shadow, which is circumscribed with relatively sharp outline, which shows arching and notching, which is of more or less uniformly increased density, and which projects laterally into the lung fields; or, (3) when the hilum region presents a hazy appearance of increased density and is spotted, with dense shadows of irregular, sharp contour and varying size. Disease of the right side is easier to recognize than disease of the left side.

Stripelike shadows lying between the primary focus and the regional hilum lymph glands and pleuritic involvement in the region of the primary focus may be present and aid in the diagnosis.

The diagnosis of primary tuberculosis is to be made only when the patient reacts positively to the tuberculin reaction. All of my patients who revealed a primary tuberculous infection or focus gave positive tuberculin reactions.

The total number of fluoroscopies (6,329) was evenly divided between boys and girls. There were 584 single primary foci, or 9.27 per cent, and 27 multiple foci, or 9.65 per cent. Localization was lobar, and a comparison was made with the observations of other pathologists and roentgenologists.

The distribution of single primary foci in this series was mostly on the right side and in the lower lobes, so that the right lower lobe showed the most foci; next in order were the left lower lobe, the right upper lobe, the left upper lobe and the right middle lobe.

Regional disease of the hilum glands (on the same side) was found in 423, or 72.52 per cent, of the cases presenting a single primary focus. Extension from right to left was as frequent as from left to right.

Pleuritic involvement was observed in only thirty patients, or 0.05 per cent.

The total number of children with definitely positive tuberculin reactions was 4,494, or 71.02 per cent. There were only 253, or 3.8 per cent, children with definitely negative Pirquet and Mantoux reactions. There were 665 children, or 10.6 per cent, who gave a negative Pirquet reaction but on whom further tests were not made.

Discrepancies between these fluoroscopic and pathologic observations are discussed and explained on the basis of physical factors.

The importance of a thorough and complete roentgenologic examination is stressed.

UNUSUAL FORMS OF PERIOSTEAL ELEVATION*

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Periosteal elevation in childhood is not infrequently encountered, and is usually associated with scurvy or congenital syphilis. In the last year I had the opportunity to observe two children with neuroblastoma and leukemia, respectively, both of whom had roentgen-ray evidence of periosteal elevation of the long bones.

REPORT OF CASES

CASE 1.—*History.*—M. G., a boy, aged 3 years, was admitted to the hospital June 11, 1925, with the complaint of weakness, swelling of the fingers, and anemia of several months' duration. His family history was negative. The Wassermann test of the blood of both parents and of a brother was negative. The patient's past history was irrelevant. He weighed 7 pounds (3.2 Kg.) at birth, which was normal. He was breast fed for three months, then successfully weaned. He developed normally and enjoyed good health except for pneumonia at the age of 18 months and diphtheria at 2 years (for which he had received antitoxin). The present illness dated back about eight months, when the patient had had an attack of abdominal pain associated with an elevation of temperature of 103 F. for three days. He was well for the next month, then he had another attack of fever and abdominal pain which was so severe as to wake him from sleep. Similar attacks of fever and abdominal pain recurred every two weeks for the next four months. For the last month he had complained frequently of pain in his legs on walking. Loss of weight and pallor became noticeable and the weakness increased, requiring him to remain in bed. Several times during the last ten days his feet and right elbow had become swollen, warm and tender. His fingers also had swelled and had been tender but not painful. Various medication from time to time had been unsuccessful.

On admission, the temperature was 100 F., the pulse was 120, and the respirations were 26.

Physical Examination.—The patient was very weak, pale and malnourished. The skin was waxy, pale and loose, showing recent loss of weight. The cervical, axillary, inguinal, and epitrochlear glands were shotty, discrete and slightly enlarged but not tender. The eyegrounds showed pale fundi with pepper and salt appearance suggestive of syphilitic fundi. The nose was wide with a low bridge. The lips, gums and oral mucous membranes were pale. The tonsils were enlarged and irregular. The chest showed enlarged costochondral junctions and slight flaring of the ribs. The sternal region was tender. At the cardiac apex a systolic murmur was heard. The liver was 4 cm. below the costal margin in the right midclavicular line. There were large spindle-shaped swellings about the proximal phalanges of the middle and index fingers of the left hand and similar swellings about the middle phalanx of the right little finger, which were not tender or red. The left elbow and the left knee appeared larger than the corresponding joints on the right side, but were not larger by actual measurement. The shin regions were tender.

Laboratory Examination.—The Wassermann test of the blood was negative, and remained negative after a provocative dose of neoarsphenamine. The Was-

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* From the Pediatric Department of Mt. Sinai Hospital, New York.

sermann reaction of the spinal fluid was negative. The Pirquet and Schick tests were negative. The Dick test was positive. The Mantoux test with 1 mg. of tuberculin was negative. The hemoglobin content of the blood was 30 per cent; red blood cells, 2,200,000; white blood cells, 9,200. Differential white cell count showed: polymorphonuclears, 24 per cent; small lymphocytes, 76 per cent. The color index was 0.7. The blood smear showed slight anisocytosia and poikilocytosis. Urinalysis was negative. Roentgenograms of the hands and the sternal region including the chest were negative.

Course and Treatment.—The patient was given an extra amount of fresh fruit and vegetables because of a suggestion of scurvy. A blood transfusion of 200 cc. resulted in temporary improvement of the general condition, but the hemoglobin content rose only to 35 per cent. He perspired profusely, and frequently complained of pain in the hand, elbow and knee joints and had an elevation of temperature to 103 F. Salicylates in large doses neither lowered the temperature nor relieved him of the pain. He had periods of fever for a week, alternating with shorter afebrile periods. Because of the dactylitis, appearance of the fundi, and the suggestive appearance of the nose, antisyphilitic treatment in the form of mercuric chloride was given for three successive weeks, without any improvement. A few days after the last injection the patient complained of severe pain in the left hip. The dactylitis returned, but now the fingers were red, warm and tender with cuff-like swellings. The poor general condition necessitated a second transfusion, and 300 cc. of citrated blood was given with remarkable results. The dactylitis promptly disappeared, the temperature dropped to normal, the appetite and color increased threefold, and the general condition improved strikingly. The patient then began to have severe pains in the legs. Examination revealed moderate tenderness in the anterior tibial region of both legs. Roentgen-ray examination revealed periosteal elevation of the upper third of both tibiae, of the lower third of the right humerus and throughout the radii and ulnas of both forearms. In addition, the left radius showed a widening of the bone shadow with cortical erosion extending to the raised periosteum. The right ulna showed similar changes. Roentgenograms taken two weeks later did not show any tendency toward healing or lime deposition.

As the disease progressed, the lymph nodes became universally larger, the liver could be felt 8 cm. below the free border of the ribs in the right mammary line, and the spleen became palpable 5 cm. below the costal margin in the left midclavicular line. The skin, eyelids and lips frequently showed hemorrhages; the child vomited coffee ground fluid, and blood was noted in the stools. Dactylitis, pain in the legs, arms and sternal region recurred. The tourniquet test, which formerly was negative, became positive; the bleeding time became prolonged, the platelets dropped to 18,000; the hemoglobin content dropped to 32 per cent, and the white blood cells rose to 33,000, with 2 per cent polymorphonuclears, 30 per cent small lymphocytes and 68 per cent myelocytes. A diagnosis of myeloid leukemia was made and confirmed by repeated examination of the blood. Hemorrhage from the gums and mouth occurred, and the child became practically moribund. He was taken home against our advice on August 8, and died there twelve hours later. A postmortem examination was not made.

Case 2.—*History.*—R. H., a boy, aged 2½ years, was admitted to the hospital, June 9, 1925, with the complaint of fever and progressive weakness for six and one-half weeks. His family history was negative and his past history was irrelevant. Birth was normal and the child was breast fed for nine months then successfully weaned. He developed normally and enjoyed good health except for an attack of diarrhea with acidosis at the age of 18 months. His diet, since the age of 6 months, had always contained fresh fruit and vegetables. His present illness had started about July 20, or ten weeks before admission to the hospital, when the left upper eyelid had swelled, the temperature had ranged from 102 to 104 F., and mucus had been present in the stools. On August 1, the right upper eyelid had become swollen. Two weeks later, the patient had had oliguria, dysuria

and red urine. The condition had been diagnosed as nephritis, and the boy had been sent to a hospital, where he was found to have swollen eyelids, a hemoglobin content of 40 per cent and the usual picture of secondary anemia. Otherwise the blood, both morphologically and chemically, was normal. The urinalysis was also negative. Roentgen-ray examinations of the lungs and kidney regions were negative. The temperature had hovered about 103 F. during the second week of his stay in the hospital, and as soon as it became normal he had been taken home against the physician's advice. A definite diagnosis could not be made at that time. At home he had been restless, cranky and weak. He had tired easily and lost weight, and had frequently complained of pain in the legs which were tender. The temperature had risen to 102 F., but there had not been any more urinary or gastro-intestinal difficulties.

On admission, the temperature was 102 F., pulse was 120 and respirations were 32.

Fig. 1.—The periosteal elevation of the lower third of the right humerus, ulnas and radii of both forearms, with cortical erosion and widening of bone shadow in left radius.

Physical Examination.—The patient was undernourished, weak, pale, fretful and rather apprehensive. The skin had a peculiar grayish or greenish color. The axillary, cervical and inguinal lymph nodes were discrete and enlarged to about 1 cm. in diameter. The eyegrounds were pale. The lips, gums and buccal mucosa were pale The tonsils were moderately enlarged. The liver was felt 3 cm. below the costal margin in the right midclavicular line. Not any masses were palpable.

Laboratory Examination.—These observations were made: hemoglobin content of the blood, 35 per cent; red blood cells, 2,300,000; color index, 0.8; white blood cells, 9,000; differential white count showed polymorphonuclears, 56 per cent; small lymphocytes, 36 per cent; myelocytes, 2 per cent; myelogones, 2 per cent; myeloblasts, 4 per cent. The blood smear showed moderate anisocytosis and poikilocytosis. The bleeding time was two minutes; clotting time, two minutes; clot retraction, ninety minutes; tourniquet test, negative; blood platelets, 32,000. A faint trace of albumin was found in the urine. The Bence-Jones protein test and the sugar test were negative. A few red blood cells, white blood cells and rare hyaline and granular casts were found.

Course and Treatment.—Two days after admission the left eye seemed to be bulging, suggesting either neoplasm or scurvy. Roentgenograms of the skull and chest were negative. The left upper eyelid swelled more and became ecchymotic. The exophthalmos increased, and the superficial left temporal veins became distended. Six days after admission the temperature rose to 104 F., and the general condition became worse. The axillary lymph nodes became enlarged. Two weeks after admission, because the patient's condition was very poor, a transfusion of 300 cc. of citrated blood was given, which caused a drop in temperature and a general improvement in strength, color, appetite and disposition, and a rise of the hemoglobin content from 25 to 40 per cent. He began to have purpuric skin eruptions and occasionally vomited coffee ground material. Pain in the legs troubled him, but they were only slightly tender on palpation. Roentgenograms

Fig. 2.—Periosteal elevation of the lower half of both femurs and of the upper third of both tibias in the case of neuroblastoma.

of the extremities revealed periosteal elevation at the upper third of both tibiae and at the lower third of both femora. About one month after admission his condition became poor, but a transfusion of 300 cc. of blood was not very effective. The right eye began to show exophthalmos a few days later, and the right axillary lymph nodes seemed to have fused into one firm mass. On October 15, or five weeks after admission, biopsy of the right axillary nodes was made and a diffuse round cell infiltration was found in the glands and surrounding areolar tissue, suggesting leukemic changes.

The patient's head began to grow, and the suture lines separated. He wanted to be left alone, ate very little and vomited when food was forced. He also vomited at times unrelated to meals. Lumbar puncture yielded clear fluid under

Figure 3A

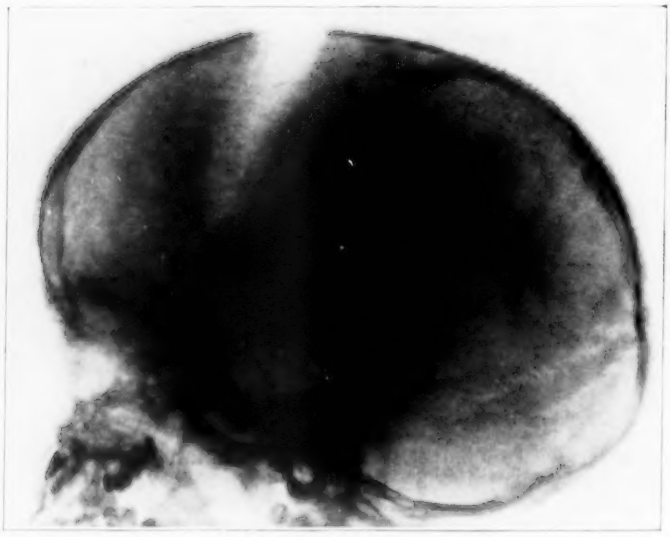

Figure 3B

Fig. 3 (case 2).—*A* indicates skull with normal appearance; *B*, the same skull seven weeks later. The cranial vault is thinned out and has a motheaten appearance. The bones are separated by the tumor mass and the suture lines, especially the coronal suture, are very wide. The head is much enlarged.

markedly increased pressure which was clear with only three cells and no globulin, and the Wassermann test was negative. On October 23, or six weeks after admission, several soft tumor masses about the size of large almonds were felt on the vertex, occiput and left temporal region. The spleen became palpable almost simultaneously and grew to 4 cm. below the left costal margin in the left midclavicular line. The head grew to 56 cm. in circumference, and the space at the longitudinal sutures was about 1½ inches wide. The nodules on his head increased in size and grew toward each other, the exophthalmos increased until the left eye was almost enucleated and the optic neuritis had progressed until there was complete loss of vision in that eye. He refused to eat and became emaciated; he then became moribund and died.

The white blood cells remained about 10,000 throughout. At first, repeated counts revealed about 8 per cent cells of the myelotic series, and on one occasion

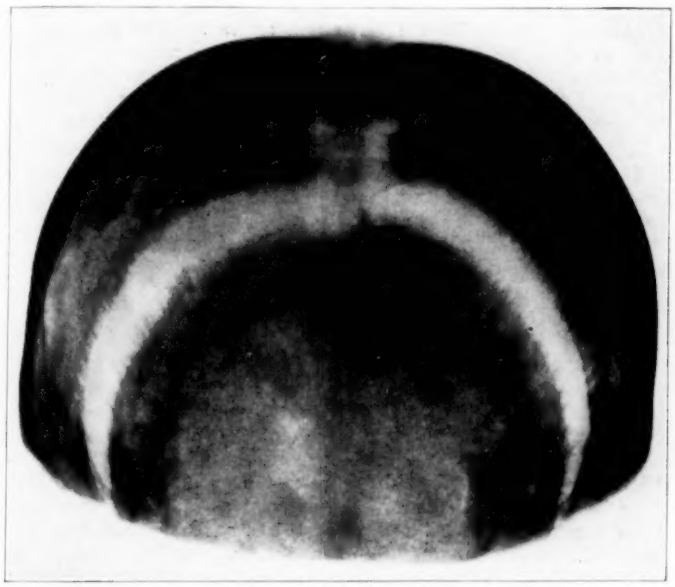

Fig. 4 (case 2)—The calvarium, showing the widespread suture (coronal) and the tumor mass along the sagittal suture.

there were about 39 per cent normoblasts. Later, the lymphocytes had increased to 80 per cent.

The course of the disease was characterized by onset with gastro-intestinal and urinary disturbances, followed by Pel-Epstein type of recurrent fever, anemia, weakness, loss of weight, progressively increasing exophthalmos (more on the left side), enlargement of the head and the separation of the suture lines, appearance of tumor masses under the scalp, general glandular enlargement, liver and splenic enlargement, and hemorrhagic tendencies. The urine contained blood on three occasions.

The diagnoses suggested from time to time were: Chloroma, neuroblastoma, scurvy, leukemia, leukosarcoma, or some other form of sarcoma originating in the kidney region.

Pathologic Report.—The body was that of a fairly well developed, markedly emaciated boy, aged about 3 years. Rigor mortis was complete. The skin was pale and white. There was very marked exophthalmos of the left eye and dilata-

tion of the veins of the left temporal region. The pupils were unequal, the left measuring about 2 mm., and the right about 4 mm. in diameter.

The head was unusually large and the surface of the skull was irregularly elevated in numerous areas. The suture lines all gaped widely, admitting the width of a finger easily. The left eye bulged. On reflecting the scalp there was seen a widespread, dark blue tumor infiltration, which involved practically the entire calvarium with the exception of the right temporal area. The skull cap was irregularly thickened, the thickness varying from 1 to 3 cm. The tumor tissue involved the bone where it was cut across, giving the impression that the tumor was primarily bony in character, and that it had elevated periosteum on one side and periosteum on the other. At two points on the inner side of the skull overlying the frontal lobe of the right side of the brain, there were two tumor masses about 2 cm. in diameter elevating the dura and indenting the surface of the brain. With the exception of the possible penetration at these two points, there was not any tumor tissue within the dural envelop. The tumor infiltration extended anteriorly to the lateral walls and entire floor of the anterior fossa. On removal of the orbital plates the left retrobulbar space was full of tumor and the left optic nerve was thinned out and compressed. The right retrobulbar space was also infiltrated with tumor tissue but not nearly as extensively as the left. The tumor appeared to involve the cribriform plate. The floor of the posterior fossa showed several large masses. The brain was extremely pale but did not seem larger than normal. In the right frontal region two slight depressions into the cortex were seen. These were somewhat hemorrhagic. There was not any exudate or hemorrhage.

The liver weighed 440 Gm., was enlarged and extended 7 cm. below the xyphoid process in the midline. The capsule was smooth, and the surface was yellowish brown and showed distinct lobulations. On section, a similar color and lobulation was visible and the parenchyma was firm.

The spleen weighed 25 Gm., and was slightly enlarged. At one portion the capsule was thickened, opaque and adherent to the under surface of the diaphragm. The remainder of the capsule was smooth and glistening. On section, the spleen was moderately firm, deep red and revealed a very marked prominence of the malpighian corpuscles which everywhere seemed to be crowding out the remainder of the pulp.

The kidneys were normal in size, shape and position. They weighed 80 Gm., and the capsules stripped with ease. The surface was smooth, pale gray, traversed by linear red markings of the blood vessels. On section, the kidneys were firm, pale and showed the normal relationship between cortex and medulla.

Along the vertebral column from the eighth to the tenth dorsal vertebrae was a firm mass adherent to the periosteum. It was grayish white and resembled fat but was paler and firmer. The peri-aortic lymph nodes were firm and enlarged, and on section had a grayish-white appearance similar to the paravertebral mass. The mesenteric lymph nodes were enlarged, hemorrhagic and firm. The inguinal and axillary nodes were firm and discrete.

A piece of bone, taken from the elevation from the right femur, was that of a neoplastic focus. All other structures were normal.

Microscopic Examination.—Paravertebral Mass: The tumor was made up of dense connective tissue in which there were islands of loosely distributed cells, which were composed of large and small undifferentiated, lymphoid-like, primitive nerve cells. Many were round with deeply staining nuclei and scanty cytoplasm. Others had rounded bases with pointed apexes over which fine fibrillar processes extended. Numerous mature ganglion cells were also seen, some of which were degenerated. A few giant cells were also present, which lay in loose fibrillar and granular substance which stained brown with eosin and van Gieson stains. Here and there nerve fibers were seen arranged in bundles which appeared embryonic. Characteristic rosets were not seen in this slide but were present in other parts of this mass. Sections through other levels of this tumor showed less connective tissue and more cellular structures.

The tumor of the skull lay on fibrous tissue basement membrane, presumably the dura mater. The cells occasionally polarized around central fibrillar masses resembling roset formation. Areas of hemorrhage were also seen; otherwise it was similar to the tumor mentioned in the foregoing.

The orbital bone showed the same metastatic picture as elsewhere.

The tumor from the long sinus showed a blood platelet thrombus.

In the several sections of the white matter of the brain there were small ring-like accumulations of gliomatous and neoplastic cells unrelated to blood vessels. A large nodule overlying the aqueduct of Sylvius, presenting the histologic picture of a fairly mature pineal gland structure, was seen, and represented possibly a pineal rest. Thus, there were three different forms of neoplastic growth in the central nervous system and its coverings, namely (1) neuroblastoma, (2) multiple microscopic gliomas (spongioblastic ?), and (3) pinealoma. They were all ectodermal in origin.

The liver showed marked fatty infiltration involving large parts of the lobules. In some places the infiltration was pericentral and in other places perilobular. Liver cells in these areas were almost completely replaced by fat. Kupffer cells were enlarged and phagocytic. The blood vessels were markedly thickened.

The spleen showed hyperplasia of the pulp with increase of myelocytes. In the centers of the follicles histiocytes could be seen containing pigment, presumably the result of degenerated erythrocytes.

The lobules of the pancreas were well defined. There was increase in interlobar connective tissue. Here and there were collections of metastatic, undifferentiated primitive neurogenic cells. The kidneys showed small collections of undifferentiated neurogenic metastatic cells in perirenal tissue. The suprarenals were normal. The lymph follicles of the mesenteric lymph nodes were well defined. Congestion was present. The preaortic ganglion showed typical ganglioneuroma with small areas of undifferentiated lymphoid neuroblastic cells. A few areas of calcification were present. The lungs were normal. The femur was decalcified and stained with hematoxylin and eosin. There were undifferentiated primitive cells in the bone; the periosteum was uninvolved.

Diagnosis.—The condition was diagnosed as ganglioneuroma and neuroblastoma arising in the paravertebral sympathetic plexus and the preaortic ganglion; metastases of neuroblastoma in the skull, brain and kidney; multiple gliomas of the brain; pinealoma.

COMMENT

A review of the literature reveals only one report of roentgen-ray evidence of periosteal involvement in leukemia. This was a case of lymphatic leukemia recently reported by Taylor.[1] His patient was a boy, aged 2 years, whose illness started with inability to walk and swelling of the legs. Subsequently, fever, pallor, loss of weight, puffiness of eyelids and painful extremities on passive motion developed. The white blood cell count varied from 1,900 to 147,000 with abnormal cells of the following varieties: normoblasts, myelocytes, myeloblasts, macrocytes and lymphoblasts. He had four aleukemic periods in two months. Roentgenograms of all long bones, including the metacarpals and the metatarsals, showed periosteal elevation with some productive changes. Necropsy revealed lymphatic infiltration in the spleen and underneath the periosteum of the tibia, and replacement of the bone marrow in several of the bones.

1. Taylor, H. K.: Periosteal Changes in Lymphatic Leukemia, Radiology **6**:523 (June) 1926.

Allison [2] reported a case of chloroma with roentgen-ray observations in 1924, in a boy, aged 5 years, who complained of painful joints, headache and swelling of his eyes. Roentgen-ray examination revealed periosteal elevation of the humeri, with bone deposit subperiosteally and a peculiar rarefaction of the medulla. Several soft tumor masses were felt under the scalp. There was wide separation of the suture lines of the skull. This case bears a striking resemblance to the case of neuroblastoma reported by me, but differs from it in that there was not any subperiosteal bone deposit in either of the cases here reported. Allison makes a special point of the fact that the bone was deposited parallel to the shaft. Giles,[3] discussing nonsyphilitic periostitis, states that in bone tumors the bone is deposited perpendicularly to the shaft. He points out that bone tumors and metastases to bone are especially frequent in childhood and usually involve the bones about the knee, as was true of our cases. He does not mention leukemia or chloroma. Naegali writes: "White periosteal infiltration, naturally with the exclusion of acute illnesses, has been encountered only once by Rosenblum and in that case the bone marrow was greenish, so that there was a case of intermediary between leukemia and chloromyeloma." Naegali [4] also mentions that in acute lymphatic leukemia, as well as in chloroma and myeloid leukemia, there may be spontaneous pain of variable degrees, sometimes intolerable. Occasionally there is marked tenderness with swelling of the joints. In both of my cases pain in the extremities was significant, and in the case of leukemia the swelling of the fingers and occasional swelling of the knees and elbows were prominent signs. Ewing,[5] discussing chloroma, says that the points of predilection are the skull, sternum, ribs and vertebrae. He also mentions that the long bones are rarely involved, but that the bone marrow is regularly affected. Of leukemia he says that there is marked invasion of the bone by hyperplastic marrow, also penetration of the shaft and invasion of the periosteum with miliary leukemic nodules. MacCallum [6] states that in chloroma there is formation of tumor-like growths in the marrow which extend through the cortex of the bone to spread over the periosteal surface. This invasion may take place along the lymphatic grooves. Glosmet [7] states that about 50 per cent of cases

2. Allison, R. G.: Bone Findings in Chloroma, Radiology **3**:388 (Nov.) 1924.

3. Giles, R. G.: Roentgen Studies of Non-Luetic Periosteal Bone Lesions, Am. J. Roentgenol. **10**:593 (Aug.) 1923.

4. Naegali, O.: Blut Krankheiten und Blut Diagnostik. 4, Berlin, Verlag von Julius Springer, pp. 374, 401, 407, 418.

5. Ewing, J.: Neoplastic Diseases, Philadelphia, W. B. Saunders Company, 1922.

6. MacCallum, W. G.: A Textbook of Pathology, Philadelphia, W. B. Saunders Company, 1916.

7. Glomset, D. J.: Malignant Sympatheticus Tumor of the Right Suprarenal, Arch. Int. Med. **16**:341 (March) 1915.

of neuroblastoma show bone involvement. In his opinion, involvement of the long bones was not common, possibly because of inadequate search. All authors agree that neuroblastoma most frequently involves the lymph nodes and bones, especially the bones of the skull, as in my case.

From observations made in cases of chloroma and allied conditions, it may be assumed that in leukemia the periosteal elevation may be the result of infiltration of lymphoid or myeloid cells penetrating the bone cortex along the course of the lymphatic vessels, eroding it and spreading out in the subperiosteal area lifting off the periosteum.

Almost all other forms of periosteal elevation are the results of inflammatory, exudative, metabolic or neoplastic disease, and usually bone production takes place at the site of the periosteal elevation. Fibrous periostitis in which condition the periosteum becomes adherent to the bone is an exception. In neoplastic disease the periosteum is usually infiltrated, as was true in the case of neuroblastoma reported here.

CONCLUSIONS

1. Painful extremities and joint swelling occurring in leukemia and allied conditions are suggestive of periosteal elevation and cortical erosion, and roentgen-ray evidence of this condition should be sought.

2. A case of neuroblastoma with periosteal infiltration with roentgen-ray evidence of periosteal elevation and wide separation of cranial sutures is presented.

3. Periosteal elevation which is nonsyphilitic and not scorbutic in origin in childhood should suggest the possibility of leukemia or allied conditions, or neoplasm such as neuroblastoma.

SUPPLEMENTARY FEEDING OF SCHOOL CHILDREN *

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Two comparisons of fruit and milk as supplementary lunches for school children have been carried out by this department. The first was made by Margaret S. Chaney [1] in 1923 at the Claremont school in Oakland, with 200 undernourished children as subjects. These children were all 7 per cent or more underweight according to the Wood standard.[2] Using different subjects, she made two trials of eight weeks each, and weight, standing and sitting height, as well as medical and dental records, were noted at the beginning and end of each period. The children were nearly all of prepubescent age, varying in age from 5 to 14 years. No attempt was made to influence the home diets, which must have varied widely, although probably no poverty was present. In both trials the children receiving oranges as supplementary food showed the largest amount of growth; those receiving milk, the next largest; and the control group, who received no supplementary lunch, showed the least.

A second study [3] was made in the spring of 1925, at the California Schools for the Deaf and Blind at Berkeley. Here the table diet of all the children was the same, but the numbers studied were smaller than in the previous trial. Forty-seven children, some underweight, some normal and some overweight, according to the Baldwin-Wood scale,[4] were given various supplementary lunches for eighteen weeks. Weight, standing height, sitting height, chest expansion, chest circumference, vital capacity, hand grip strength and several other measurements were made at regular intervals. The lunches given were one orange, four pulled figs and one-half pint of milk. Varying degrees of growth in the different physical measurements were noted, the group given orange having the largest average increase, those receiving figs and milk next, and the control group having the least increase. Certain other studies

* Received for publication, Oct. 12, 1926.

* From the Laboratory of Household Science, the University of California.

1. Chaney, M. S.: A Comparison of Milk and Oranges as Supplementary Lunch for Underweight Children, Am. J. Dis. Child. **26**:337-348 (Oct.) 1923.

2. Wood, T. D.: U. S. Dept. of Interior, Bureau of Education, March, 1920.

3. Morgan, A. F.; Hatfield, G. D., and Tanner, M. A.: A Comparison of the Effects of Supplementary Feeding of Fruits and Milk on the Growth of Children, Am. J. Dis. Child. **32**:839 (Dec.) 1926.

4. Baldwin, B. T., and Wood, T. D.: Mother and Child, 1923, July suppl. Am. Child Health Assn., Washington, D. C.

of basal metabolism [5] and plasma carbon dioxide capacity [6] made at the same time indicated a possible advantage in the use of the fruits, resulting from their relatively high basic ash. The fig was chosen for this study chiefly because of this reported basicity, 97.1 cc. excess of normal base per hundred grams.[7]

Another comparison was made in the spring of 1926, using children in attendance at the Livermore high school. Three groups were used: each of the children in one group was given an orange every school day

TABLE 1.—*Physical Measurements of High School Children Given Supplementary Lunches for Eight Weeks*

Subject	Sex*	Age, Years	Weight		Standing Height, Inches	Sitting Height, Inches	Chest Circumference, Inches	Chest Expansion	
			Beginning, Pounds	End, Pounds				Beginning, Inches	End, Inches
1	♀	16	90	100	66	33.5	28.0	1.7	2.0
2	♀	15	88	92	64	33.5	29.0	3.0	3.0
3	♀	17	114	117	65	34.5	29.0	3.2	3.2
4	♂	16	155	154	72	37.0	32.0	5.0	5.0
5	♂	17	114	116	68	34.0	30.0	4.7	4.7
6	♂	18	120	123	64	34.0	33.5	3.5	3.7
7	♀	15	90	90	61	32.0	27.5	3.5	3.5
8	♂	16	117	118	68	31.0	29.0	4.5	4.5
9	♂	18	140	140	72	36.0	32.0	4.0	4.2
10	♀	16	112	113	63	32.1	31.0	1.5	1.5
11	♀	17	110	110	65	33.0	30.0	3.0	3.0
12	♀	16	120	117	66	33.0	31.0	3.0	3.0
13	♂	15	139	138	69	34.0	31.0	4.0	4.0
14	♀	17	93	94	60	30.0	29.0	3.1	3.2
15	♀	15	110	112	63	33.0	29.0	3.0	3.0
16	♀	14	125	129	69	32.0	30.0	4.0	4.0
17	♀	18	112	114	67	34.0	29.0	3.7	3.7
18	♂	16	126	126	68	34.0	31.0	4.0	4.0
19	♀	16	102	102	62	30.5	29.0	2.5	2.6
20	♀	15	111	113	62	33.0	28.0	4.0	4.0
21	♂	17	113	114	65	33.0	31.0	4.5	4.7
22	♀	16	102	106	61	29.5	30.0	3.5	3.5
23	♀	17	105	108	63	32.0	30.0	2.5	2.5
24	♂	17	130	132	68	32.0	32.0	3.2	3.3
25	♀	16	105	106	53	33.0	30.0	3.0	3.0
26	♀	17	110	111	65	32.0	29.0	2.5	2.7
27	♂	18	131	134	68	33.5	32.0	3.2	3.4
28	♀	16	101	101	64	32.0	30.0	2.0	2.2
29	♂	17	114	114	66	33.0	30.0	5.0	5.0
30	♂	16	95	97	63	31.0	28.0	2.5	3.0
31	♀	18	120	117	52	32.5	20.0	2.0	2.0
32	♀	17	105	107	64	33.5	29.0	3.5	3.5
33	♂	15	118	118	67	33.0	31.0	3.0	3.0
34	♀	15	117	120	65	33.0	32.0	3.0	3.0
35	♀	15	88.5	89	62	32.5	27.0	3.2	3.2
36	♀	14	108	108	67	32.5	28.0	3.7	3.7

* In this column, ♀ indicates female; ♂, male.

as supplementary food; each of those in the second group, four pulled figs, and those in a control group were not given any supplementary food. These children were all of the pubescent or postpubescent age, as compared with the younger groups used in the earlier studies. The length

5. Morgan, A. F., and Hatfield, G. D.: The Basal Metabolism and the Specific Dynamic Action of Foods in Children in Various Conditions of Nutrition, Am. J. Dis. Child. **32**:516 (Oct.) 1926.

6. Morgan, A. F., and Hatfield, G. D.: The Effect of Various Supplementary Lunches On the Plasma Carbon Dioxide Capacity of Children, Am. J. Dis. Child. **32**:655 (Nov.) 1926.

7. Sherman, H. C.: Food Products, New York, the Macmillan Company, 1914.

of the feeding period was eight weeks; weights were taken every week, and the sitting height, standing height, chest circumference and chest expansion, at the beginning and end of the test period. Again the groups were small, about the same numbers as were used in the work in the California Deaf and Blind Schools, and the home diet was varied, as in the work in Oakland. Evidently this study could be expected to yield less generally applicable results, therefore, than either of the others. It was carried out, however, in the hope of discovering any

TABLE 2.—*Condition of Nutrition of Children Studied*

Number	Per Cent Overweight or Underweight		Total Weight Gain in 8 Weeks, Pounds	Lunch
	Baldwin-Wood Scale	Dreyer Standard		
1	−29	−22	10	Orange
2	−26	−29	4	Orange
3	− 8	−12	3	Orange
4	± 0	+ 9	− 1	Orange
5	−19	± 0	2	Orange
6	− 4	− 8	3	Orange
7	−16	−13	0	Orange
8	−17	+25	1	Orange
9	−11	− 4	0	Orange
10	− 4	−15	1	Orange
11	−12	−14	0	Orange
12	− 6	−14	− 3	Orange
13	± 0	+18	− 1	Orange
14	−14	−11	1	Orange
15	− 5	− 9	2	Orange
16	− 9	+ 2	4	Orange
17	− 9	−11	2	Orange
18	− 8	+ 6	0	Figs
19	−11	− 4	0	Figs
20	− 1	− 2	2	Figs
21	−11	− 9	1	Figs
22	−10	− 7	4	Figs
23	−11	−14	3	Figs
24	− 7	+15	2	Figs
25	−10	−19	1	Figs
26	−12	− 4	1	Nothing
27	− 8	+ 8	3	Nothing
28	−16	−19	0	Nothing
29	−13	− 7	0	Nothing
30	−16	+ 6	2	Nothing
31	....	− 4	− 3	Nothing
32	−14	−14	2	Nothing
33	− 9	+ 5	0	Nothing
34	− 4	−19	3	Nothing
35	−22	−15	0.5	Nothing
36	−17	− 2	0	Nothing

difference in response to such feeding exhibited by older high school children as compared with the younger subjects previously observed.

The physical measurements of the thirty-six subjects are given in table 1, and are calculated in table 2 to show the condition of nutrition as judged by the Baldwin-Wood [4] and the Dreyer [8] scales. The Baldwin-Wood standard weights are made up with reference to sex, age and standing height only, and the Dreyer weights are calculated from sex, sitting height and chest circumference. As will be noted in table 2,

8. Dreyer, G., and Hanson, G. F.: The Assessment of Physical Fitness, New York, Paul Hoeber, 1921, pp. 127.

the correlation between the indexes of nutrition is not good in many cases. In only twelve of the thirty-six cases are these standards within 25 per cent of agreement as to degree of undernutrition or overnutrition. In eight cases, children judged normal or overweight by the Dreyer scale are from 7 to 19 per cent underweight by the Baldwin-Wood scale.

The degree of undernutrition shown by these adolescent subjects is surprisingly large. It is interesting to note also that of thirty boys and fifty girls weighed and measured, only ten boys, as compared with nineteen girls, were found to be 7 per cent or more underweight for height. This is a percentage of 33 for boys, and 38 for girls. Similar tests of children at the preadolescent age usually have not disclosed a discrepancy. The average percentage of underweight in the study here reported for the boys segregated in this way is 11.9, and for the girls, 14.5. Apparently in some girls the underweight may be voluntary.

It is not possible to draw definite conclusions from these results since the number of cases was small (thirty-six) and the period of feeding was short (8 weeks). All of the children were of adolescent age,

TABLE 3.—*Weight Gains in Eight Weeks on Supplementary Lunches*

Lunch	Number of Children in Group	Average Gain in 8 Weeks, Pounds	Percentage of Group Making Weight Gains
Orange	17	1.64	64.7
Figs	8	1.62	75.0
Control	11	0.77	54.5

from 14 to 18 years, and twenty-nine of the thirty-six showed definite undernutrition, 7 per cent or more underweight for height and age by the Baldwin-Wood scale; nineteen were similarly underweight by the Dreyer scale. Thirty-three per cent of the boys and 38 per cent of the girls examined were in the underweight group. In eight weeks, the average gains in weight of the groups given one orange or four pulled figs daily for supplementary lunch were practically the same, namely, 1.64 and 1.62 pounds (table 3). However, some gains were made in 10 per cent more of the group which was given figs than of the group given orange, and in 20 per cent more of the group given figs than of the control group which was not given any supplementary feeding.

COMMENT

It is evident that the supplementary feeding of these fruits proved advantageous to the children, whether merely through added caloric intake or through vitamin or basic ash content. Attention is drawn to the greater amount and degree of underweight among these adolescent girls as compared with that of boys.

MEASLES PROPHYLAXIS

BY USE OF CONVALESCENT SERUM, ADULT BLOOD OR SERUM *

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Most children's hospitals are quarantined for some time each year on account of measles. When the service is active and there are many cases of pneumonia, especially when a large percentage of the patients are infants, the necessity of using measles prophylaxis is paramount. During the past year the pediatric service of Mt. Sinai Hospital was quarantined four times, and we were thus able to observe the efficacy of convalescent serum supplied for us by the New York Board of Health. The supply of convalescent serum was not always adequate, so that a parent's whole or citrated blood or serum was used in several cases.

REVIEW OF LITERATURE

The first successful immunization against measles by means of convalescent serum was carried out by Nicolle and Conseil [1] in 1916, and reported by them in 1918. Reports of numerous successful immunizations have appeared subsequently by Richardson and Connor,[2] Degkwitz,[3] Torres and Pacheco,[4] Manchot and Rieche,[5] von Torday,[6] McNeal,[7] DeJong and Bernard,[8] Zingher,[9] and many others. Most of this work has been done by Degkwitz in Pfaundler's clinic in Munich. Only a small percentage of failures was reported by these authors.

* Received for publication, Aug. 17, 1926.

* From the Pediatric Department of Mt. Sinai Hospital.

1. Nicolle, C., and Conseil, E.: Bull. et mém. Soc. méd. de hôp. de Paris **42**:336, 1918.

2. Richardson, D. L., and Connor, H.: Immunization Against Measles, J. A. M. A. **72**:1046 (April 12) 1919.

3. Degkwitz, R.: Ztschr. f. Kinderh. **25**:134 (May) 1920; ibid. **27**:171, 1920; Monatschr. f. Kinderh. **22**:186 (Nov.) 1921; Deutsche med. Wchnschr. **48**:26 (Jan.) 1922; Beitr. z. Klin. d. Tuberk. **57**:136, 1923.

4. Torres, M., and Pacheco, G.: Arch. latino-am. de pediat. **14**:305, 1920.

5. Manchot, C., and Reiche, F.: Med. Klin. **17**:1230 (Oct.) 1921.

6. Von Torday, F.: Ztschr. f. Kinderh. **29**:148 (June) 1921.

7. McNeal, M. D.: Serum Prophylaxis of Measles, J. A. M. A. **78**:340 (Feb. 4) 1922.

8. DeJong, S. I., and Bernard, E.: Bull. et mém. Soc. méd de hôp. de Paris **48**:500, 1923.

9. Zingher, A.: Convalescent Whole Blood, Plasma and Serum in Prophylaxis of Measles, J. A. M. A. **82**:1181 (April 12) 1924.

Von Torday,[10] summarizing the reported cases, found that of 2,000 patients in whom serum had been used, only 3 per cent were not protected completely. Most of those who were not adequately immunized had a very mild type of the disease.

Debre and Ravina [11] injected convalescent serum from the seventh to the tenth day after exposure to measles, at which time it was too late for complete protection. This produced a mild form of measles giving active immunity, a more desirable result than the transient type. The serum of patients convalescing from this mild form of the disease was successfully used to protect susceptible, exposed persons. The modified disease produced was characterized by prolonged incubation time, suppression of the symptoms of the invasion period, slight fever, absence of catarrhal symptoms and Koplik spots, a faint eruption, a short course and either mild or no constitutional symptoms. The general condition remained good and there were no complications. There was no tuberculin anergy. A disease of similar type was produced by Zingher and by Regan.[12]

Degkwitz was the first to use whole blood of adult donors who had had measles in childhood, but he gave it up on the theoretical basis that the antibody content of adult blood was insignificant. However, there are facts suggesting that adult blood is not poor in measles antibodies. One usually does not have measles more than once, and children usually do not develop measles during the first six months of life, especially not during the first three months. Degwitz gave to each of five children 30 cc. of serum, and gave 20 cc. to one. Two of the five remained entirely protected, as did the one who received only 20 cc. Three had very mild cases of measles without prodromes, and only one had a rash, which was very mild.

In 1921, Rietschel [13] advocated the use of serum or whole blood of adults who had had measles for the protection of exposed persons. He recognized that the difficulties in the use of convalescent serum were: First, except during epidemics, the quantity of serum available would be limited; second, it would be difficult to secure a sufficient amount of serum for hospitals, nurseries, orphanages, etc., and in small cities and country towns the access to serum would be still more difficult, and third, the amount of blood which it would be necessary to take from one child to cover the needs of another would be too great for the average lay person to tolerate its loss. As a result the procedure would soon fall into disuse. Rietschel, using whole adult blood, gave 20 cc. to each of

10. Von Torday, F.: Jahrb. f. Kinderh. **102**:213 (June) 1923.
11. Debre, R., and Ravina: Paris Letter, J. A. M. A. **80**:709 (March 10) 1923.
12. Regan, J. C.: Symptomatology of Measles Modified by Late Serum Immunization, J. A. M. A. **83**:1763 (Nov. 29) 1924.
13. Rietschel: Ztschr. f. Kinderh. **29**:127 (June) 1921.

three children. At thirteen days all developed mild attacks of measles which lasted for from twenty-four to thirty-six hours clinically. To each of nine exposed children he gave 20 cc. of adult serum. Four remained protected completely, and five had a very mild type of the disease.

Zingher used from 10 to 20 cc. of convalescent whole blood in twenty-five subjects exposed to measles. Of these, two received injections on the eighth day after exposure and developed a mild form of modified measles. The others received injections from the first to the eighth day after exposure, and were fully protected. In the absence of a convalescent donor, Zingher [9] has found that adult blood in double or triple quantities was protective. He says, "The presence of measles antibodies in adult blood is extremely important, as it enables us to utilize a source of serum supply that is universal and readily available, whereas with convalescent serum we are dependent on a limited number of donors."

METHOD OF COLLECTION AND OPTIMUM TIME FOR BLEEDING DONORS

Blood is drawn under sterile precautions as for transfusion. It is citrated or not, according to the desire to use whole blood or plasma, or serum. If the serum is to be stored, it is preserved with 0.25 per cent tricresol, divided into 5 or 10 cc. portions and kept on ice until ready for use. If convalescent serum of more than one donor is available, the two or three kinds of serum are pooled before being divided into small portions. All donors should be free from tuberculosis. The blood is cultured aerobically and anaerobically, and the Wasserman test of the blood is made before it is used. If a small amount of whole blood (up to 50 cc.) is required, a suitable luer syringe may be used, with or without 2 to 3 cc. of 5 per cent sodium citrate. The blood may be injected into the patient with the same syringe, the needle being changed. Injections are usually given intramuscularly or subcutaneously. It is known that large doses given intravenously are effective, but we have not made any observations with small quantities given directly into the blood stream.

The optimum time for obtaining convalescent blood is from the sixth to the tenth day after the temperature has reached normal, but blood taken from persons several months or even years after they have had the disease may also be used with some success. All adults used as donors should have a past history of measles, even if they had the disease far back in childhood. Convalescent serum may be stored as long as six months without any serious loss of effect. Adult blood or serum may be kept for weeks under sterile conditions.

DOSAGE

The doses recommended by Degkwitz for complete protection are 2.5 cc., or 1 immunizing unit, for children up to 3 years of age who have been exposed for not more than four days; 5 cc., or 2 units, for those children if exposed for from five to six days, and 7.5 cc., or 3 units, if exposed for seven days. For older children, he states that the dose should be in proportion to age and weight. According to the same author, an injection of serum on the eighth day or later will not prevent the disease or modify the symptoms, but the experience of Zingher and of some French [11] observers was that they were able to prevent the occurrence of the disease in some and to modify its course in others when serum was injected as late as the eighth and ninth days after exposure.

For the production of the modified form of measles, Zingher advocates the injection of 2.5 cc. of convalescent serum or 5 cc. of serum from a brother or sister who has recovered from measles some time previously or 10 cc. of adult serum, from the fifth to the tenth day after exposure.

From a review of the literature and our own experience, our estimate of the approximate dosage for prophylaxis is found in table 1.

TABLE 1.—*Approximate Dosage for Prophylaxis*

Age	Exposure, Days	Convalescent Serum, Cc.	Adult Blood, Cc.	Serum, Cc.
	For Complete Protection			
3 months to 3 years	1-4	5	65-75	25-30
3 months to 3 years	5-7	10	75-100	30-40
3 years or over	1-4	10	75-100	30-40
3 years or over	5-7	15-20	100-150	40-50
	For Production of Modified Measles			
3 months to 3 years	1-4	2-3	25-40	10-15
3 months to 3 years	5-7	3-4	25-50	10-20
3 years or over	1-4	3-4	40-50	15-20
3 years or over	5-7	5	40-60	15-20

If measles is diagnosed in a patient when he has Koplik spots but no rash, or on the first day of the rash, the children who have been in contact with the patient constantly are considered as having been exposed three or four days, respectively. If a child develops Koplik spots or a rash on the day of admission or the next day, the period of exposure is calculated as one or two days, respectively.

PROCEDURE

When a case of measles is found in a ward, the patient is isolated, sent home or sent to an isolation hospital, and the ward is quarantined for two weeks. New patients who have had measles are admitted and those who have had measles and no longer need hospital care are discharged. All children in the wards, all nurses, physicians, and other

attendants are examined for Koplik spots and other manifestations of measles. The histories of all children are carefully investigated to determine whether they have had measles. Convalescent serum, if available, is promptly given to all susceptible children in the dosage recommended. If the supply of convalescent serum is inadequate, the older children and those less seriously ill are not treated for the time being. Their parents are summoned, the importance of prophylaxis is carefully explained to them, and they are requested to donate blood in quantities required. If the parents are not willing to give blood, the professional donors are summoned, and the necessary blood is obtained.

If a two week period is set for quarantine, the first day to be figured should be the date of admission of the last susceptible patient after measles is known to have existed in that ward. If prophylaxis is not given for full protection, the quarantine should be prolonged beyond two weeks, possibly up to three. A sick child protected once by use of measles prophylaxis, if reexposed during his stay in the ward, should receive another injection. When it is imperative to admit a child who has not had measles, he should receive prophylaxis in protective dosage.

RESULTS WITH CONVALESCENT SERUM

In the four outbreaks in the wards, seventy-seven patients giving no history of having had measles were exposed for three or four days and four for five days. Thirty-six, or 47 per cent, were 1 year of age or younger; sixty-six, or 86 per cent, were 3 years or younger, and thirty, or 39 per cent, were from 1 to 3 years of age. Twenty-eight, or 37 per cent of the total, had signs and symptoms of pneumonia at the time of exposure. Ten of these twenty-eight were 1 year old, or younger.

Three of these children, aged 2, 3 and 6 years, were left untreated, each during a different outbreak. Each one developed a typical case of measles at the expected time of from eleven to fourteen days after exposure. Of the seventy-four remaining, sixty, or 81 per cent, received convalescent serum on the third or fourth day after exposure. Five cubic centimeters was given intramuscularly to all but four who were 6 years of age or older; these four received 10 cc. Three patients who were over 3 years received only 5 cc., and remained completely protected.

Of the sixty patients treated with serum, eleven, or 17 per cent, developed a modified type of measles from twelve to twenty-four days after exposure. Eight of these eleven were treated with the same serum obtained by the board of health from a donor five days after his temperature had come down to normal. Three of the eleven who had modified measles returned two months later, one with unresolved pneumonia, one with *Streptococcus hemolyticus* sepsis and cervical adenitis, and the third with the same tuberculosis adenitis which was

present on her first admission. All of these three were reexposed to measles, were left untreated and remained protected, thus showing that the mixed immunity obtained from modified measles and the convalescent serum was adequate to protect them for at least two months.

REPORT OF CASE

G. B., a boy, aged 5 months, suffering from pneumonia, otitis media, rickets and malnutrition, was given 5 cc. of convalescent serum on the fourth day after exposure and remained protected. On the fourteenth day this child was reexposed to measles. His general condition improved enough so that he was discharged. Eighteen days from the time of reexposure he returned with a typical picture of measles, recurrence of pneumonia and otitis media. He was sent to an isolation hospital, returned to the ward three weeks later in very poor condition and died. Necropsy revealed numerous lung abscesses. This case is of interest because the child was only 5 months of age when exposed, and the passive immunity due to the serum lasted only two weeks. It may be supposed that the incubation period was twenty-eight days from the first exposure, or that the child overcame the first infection, then was reinfected ten days later and came down with the disease eighteen days after the second exposure.

Drs. Herman Schwarz and Murray Bass were kind enough to permit us to report their results with convalescent serum in private practice. They had twenty-three and ten cases, respectively. Dr. Abraham Zingher injected into each child 5 cc. of convalescent serum obtained from the New York Board of Health. All children were well before exposure. The results are shown in table 2.

TABLE 2.—*Results with Convalescent Serum in Private Practice*

No. of Cases	Age, Years	Exposure, Days	Complete Protection	Modified Measles	Measles
3	1	5-6	2	1	..
8	2-3	5-6	8	..	..
5	3-5	3-6	3	2	..
1	5	9	..	1	..
6	6-12	7-10	..	2	4
10	6-12	3-5	10	..	..

Six children, 6 years or older, who were given serum after the sixth day, developed measles. Four had measles of usual severity and two had the mild type. The younger children who were not fully protected had the mild type of the disease, with an incubation period up to twenty-one days. Complications did not occur.

In three patients (cases 5, 6 and 7), transfusions were given both prophylactically against measles and therapeutically for other indications.

Two patients (cases 13 and 14) were treated therapeutically when they were exposed to measles. We thought that the transfusions would act as prophylaxis, but we were unaware, at the time, that the donors had not had measles.

Of the fourteen patients treated with adult blood or serum, three developed measles. Two of these were given blood from parents who

had never had measles. Even then the period of incubation was twenty-three days in the one who otherwise ran a fairly typical course and twenty-one days in the other. The course of the disease in this patient was much milder. He had a mild rash for five days and a temperature of 103 F. for the first two days. The children ranging in age from 2 months to 12 years were protected.

TABLE 3.—*Results with Adult Blood or Serum Used as Prophylaxis*

Name	Age, Years	Date of Exposure	Date of Prophylaxis	Prophylaxis	Course
A. Cases Treated After Exposure to Measles					
1. I. S.	5	5/6-5/11	5/11/26	25 cc. serum father's intramuscularly	Complete protection
2. R. P.	12	3/2-3/ 6	3/ 6/26	30 cc. serum subcutaneously; Prof. donor	Complete protection
3. H. C.	10	3/2-3/ 6	3/ 6/26	30 cc. serum subcutaneously; Prof. donor	Complete protection
4. R. C.	10	3/2-3/ 6	3/ 6/26	35 cc. serum subcutaneously; Prof. donor	Complete protection
5. H. A.	1	5/7-5/11	5/12/26	150 cc. citrated father's blood intravenously	Complete protection
6. Y. H.	1	5/7-5/11	5/10/26	150 cc. citrated mother's blood intravenously	Complete protection
7. F. M.	10 mo.	5/7-5/11	5/ 7/26 5/27/26	50 cc. serum..... 100 c.c. citrated blood	Complete protection
B. Cases Transfused Therapeutically Before Exposure to Measles					
8. D. F.	4 yr.	5/7-5/11	5/ 4/26	200 cc. citrated blood intravenously	After 31 days had temp. 101 F., mild and discrete rash; sat up and seemed comfortable
9. R. P.	15 mo.	1/8-1/11	12/15/25	90 cc. serum from mother intravenously	Complete protection
10. I. C.	6 mo.	1/7-1/11	12/ 7/25	125 cc. citrated mother's blood intravenously	Complete protection
11. W. R.	2 mo.	5/7-5/11	4/31/26	100 cc. citrate transfusion mother's blood	Complete protection
12. A. S.	6 yr.	3/2-3/ 5	2/14/26 2/21/26 2/22/26	300 cc. citrate transfusion... 300 cc. citrate transfusion 300 cc. citrate transfusion	Complete protection
C. Cases Transfused with Blood of Adult Donors Who Had Not Had Measles					
13. M. S.	1 yr.	1/7-1/10	1/ 6/26	140 cc. citrated father's blood intravenously	After 23 days or on 1/30 coryza, Koplik spots, confluent rash, and quite sick
14. E. C.	2 yr.	1/7-1/10	12/ 8/25	175 cc. mother's citrated blood intravenously	After 21 days mild rash for 5 days, 103 fever 2 days, mild coryza, few hemorrhagic Koplik spots

The longest period of time elapsing between the time of transfusion and the exposure to measles was one month in the case of a child with otosclerosis, aged 6 months, two years in a child with chronic bronchitis and mastoiditis, and three weeks in a child with empyema, aged 15 months. Of these three patients, only the second developed measles. Four of these (cases 4, 9, 10 and 14) were reexposed two months later and remained protected.

Table 4 summarizes the treatment and results in all of our cases.

TABLE 4.—*Summary of Treatment and Results*

Age	Number of Patients	Exposure, Days	Prophylaxis: Convalescent Serum	Prophylaxis: Adult Blood	Prophylaxis: Omitted	Protected: No.	Protected: %	Incompletely Protected: No.	Incompletely Protected: %
2 months to 1 year...	36	3 to 4	..	..	0	..	..	0	..
			30	..	..	28	93	2	7
				6	..	5	83	1	17
1 to 3 years.....	30	3 to 4	..	..	2	0	0	2	100
			26	..	..	19	73	7	23
				2	..	1	50	1	50
3 to 12 years.....	11	3 to 4	..	..	1	0	..	1	100
			4	..	..	4	100	0	..
				6	..	6	100	0	..

MODIFIED FORM OF MEASLES

The type of the modified form of measles observed in our fourteen cases was characterized as follows:

1. The period of incubation ranged from twelve to thirty-one days.

2. During the period of invasion, the children were either not sick or had mild clinical symptoms.

3. Coryza and photophobia were either mild or absent.

4. Koplik spots were usually absent, but there were a few hemorrhagic spots in four cases which lasted only for from two to four days. In three cases the enanthema simulated a follicular tonsillitis with white spots on the soft palate and tonsils, associated with elevation of temperature to 103 F., or over, and discomfort. The entire picture cleared up in from twenty-four to thirty-six hours.

5. A prodromal rash was not infrequent, but it was mild.

6. The eruption was either absent or very scanty, with few small or moderate sized spots on the face, trunk and extremities, usually discrete but sometimes confluent, and lasting only a day or so except in those patients who had almost as severe a rash as in the ordinary measles.

7. The general symptoms were decidedly less pronounced. Elevation of temperature was 100 to 101 F. for a day or two. Occasionally, the temperature was 103 to 104 F. for a day or so. Most of the children remained sitting up, and were happy, playful and had a good appetite.

8. None of our treated patients had complications. Several patients, however, had otitis media or pneumonia before and during exposure to measles, thus precluding the possibility of acquiring these infections during their modified illness. As well as we could observe clinically, exacerbations of the diseases from which these patients suffered were not caused by the modified measles. The difference in general condition between a child with modified measles and one with ordinary measles is very striking. In the first type, the child sits up, plays, smiles and is

quite comfortable and does not look very sick; in the second type, the child is irritable, drowsy, uncomfortable, looks very sick and wants to be left undisturbed.

Four of the eleven cases in which the patients were treated with convalescent serum, and which were included with the cases of modified measles, would ordinarily have been undiagnosed. One child of 18 months had a red face, white patches on the soft palate and tonsils, an elevation of temperature to 104 F. for one day, staring eyes, and running nose for forty-eight hours, all about nineteen days after exposure to measles. This child was reexposed to measles two months later and remained protected. Another child, aged 8 months, had a slight cough, a running nose and an elevation of temperature to 101 F. for twenty-four hours, and a temperature of 100 F. and a few small discrete spots on the face and neck within the next twenty-four hours; within the following twelve hours, the entire picture cleared up. Moro [14] suggested that possibly rubella and modified measles were one and the same disease. In none of our patients did the clinical picture suggest rubella.

COMMENT

Convalescent serum and whole blood have been known to be prophylactic against measles for ten and six years, respectively. That the application of this knowledge has been limited seems to be due to the small quantity of convalescent serum available and to failure to appreciate the value of adult blood.

It is the aim of this paper not only to increase the reports of results obtained with the use of convalescent serum, but also to emphasize the fact that whole blood, defibrinated or citrated blood, and serum or plasma obtained from adults who have had measles may be used prophylactically. Thus, a child may be protected completely for a short time, or may be given partial protection and permitted to develop a mild type of measles which results in a longer and more lasting, even permanent, immunity. When it is safe to permit the child to have this mild measles, it is far more desirable than complete protection, which usually results in a very transient immunity. We feel that the modified measles is usually innocuous and may be very much less contagious than the ordinary disease. In our wards four susceptible children were exposed to modified measles without contracting the disease.

An interesting comparison may be offered. A child in the surgical ward was found to have measles, and almost simultaneously one in the medical ward came down with measles. Both children were isolated, and the usual quarantine and isolation precautions were taken in both wards. In addition, in the medical ward, all children on whom transfusion had not been performed recently for some other reason were treated with convalescent serum or with transfusion of adult

14. Moro, E.: Klin. Wchnschr. **4**:1719 (Sept. 3) 1925.

blood or serum. The surgical ward remained quarantined for fifty-two days, whereas the medical ward was quarantined for thirty days, being quarantined that length of time only because one child, who was not given prophylaxis because of a history of having had measles when 8 months of age, had a typical eruption fourteen days after exposure. It might be well to recall that in the event of an outbreak of measles in a ward, no child should be admitted with a history of having had measles unless confirmatory evidence is presented, or unless prophylaxis is administered. Had that precaution been taken, our ward would have remained quarantined for two weeks only, as was true in the three other outbreaks. Far more important than the time saved is the fact that our sick children who might be more seriously ill if they had measles with pertussis, tuberculosis, pneumonia, influenza or heart disease, etc., are spared that dangerous complication.

In private practice, convalescent serum when available or adult whole blood or serum when convalescent serum is not available should be used in protective dosage whenever the condition of the health, age or environmental circumstances would make a case of measles dangerous. When complete protection is not absolutely indicated, small doses of serum or blood or late injections should be employed to produce a modified form of measles, thus producing a lasting immunity. In institutions, it would seem advisable to give prophylaxis with the aim of affording complete passive immunity. The child in the first two years of life, and the one who is suspected of having tuberculosis, should be given prophylaxis under any circumstances. One should always keep in mind the fact that measles ranks very high in the mortality list in childhood, especially in those under 2 years of age.

The fact that two children who received blood transfusions from parents who never had had measles developed measles after incubation periods of twenty-one and twenty-three days, suggests several possibilities: First, that the parents had retained some of their natal immunity, and second, that they had had the disease in early childhood (first 6 months of life) when their immunity was not sufficient to prevent the disease but was adequate to suppress it so that no clinical symptoms became manifest and a lasting immunity resulted.[15]

The delayed incubation period is noteworthy. Usually, when the disease is mild the incubation period is shorter, as in the revaccination process according to the Pirquet theory of immunity. We may assume that the earlier the measles germ is eliminated, the less time it has to reproduce pathogenic substances. It is interesting, therefore, that in the modified form of measles, contrary to the revaccination process, the disease with mild symptoms has a longer incubation period. It may be explained on the theory that measles serum damages the pathogenic germ

15. Herrmann, C.: Arch. Pediat. **32**:503, 1915; in Abt's Pediatrics, Philadelphia, W. B. Saunders Company, 1923.

so markedly that only after a much longer incubation time than usual may the pathogenic substance accumulate adequately to produce symptoms of the disease, and those in very mild form.

There are other methods of immunization against measles. DiCristina [16] and Caronia [17] have isolated a filtrable micrococcus which they claim is the etiologic factor of measles. They have cultured the organism, made a vaccine of it, and immunized animals with it. They have reproduced the disease and developed a specific skin test. Tunnicliff [18] has done almost identical work with an organism entirely different from that of DiCristina and Caronia. She has isolated a micrococcus from the blood of patients with measles in the preeruptive and eruptive stages, and she has been able to reproduce the disease with it. Sindoni [19] has isolated a gram-positive coccus like that of Caronia, which he claims causes measles. Noble and Schonberger [20] have used Caronia's vaccine early and have been able to prevent measles, but claim for it a nonspecific immunity. Schick,[21] working with the idea of nonspecificity, gave ten exposed susceptible children sodium nucleinate. All developed the usual reaction of a nonspecific protein, namely, leukocytosis and fever, but measles was not prevented in any case.

For the present, it is apparent that the hope of preventing or altering measles does not lie in the use of any of the information mentioned before. We should therefore apply the best we have available, which is convalescent serum or adult blood of parents or other donors who have had measles.

CONCLUSIONS

1. Children under 2 years, children suspected of tuberculosis, infants in hospitals or nurseries and others in whom measles would be a dangerous complication, should be treated for the purpose of obtaining complete passive immunization. All others would benefit more if given small doses or late injections of serum, which would lead to a mild modified form of measles and to lasting, possibly permanent, immunity.

2. Convalescent serum has the greatest immunity titer from six to ten days after the temperature has reached normal. Adult donors should be free from tuberculosis, syphilis and other transmittable infections, and they must have had measles.

3. For complete protection of a child up to 3 years of age who has been exposed from one to four days, 5 cc. of convalescent serum, 25 cc.

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16. DiCristina: Pediatria **22**:721, 1914; ibid. **24**, 1921; abst., 1923.
17. Caronia, G.: Pediatria **30**:439, 1922. Caronia, G., and Sindoni, M. B.: Pediatria **31**:745 (July 15) 1923.
18. Tunnicliff, R.: J. Infect. Dis. **37**:193, 1925.
19. Sindoni, M. B.: Pediatria **32**:888, 1924.
20. Noble, E., and Schonberger, M.: Ztschr. f. Kinderh. **40**:3, 1925.
21. Schick, B.: Personal communication.

of adult serum or 75 cc. of adult whole blood is given intramuscularly. If exposed from five to seven days, the same child should receive 10 cc., 30 to 40 cc. or 75 to 100 cc. of convalescent serum, adult serum or whole blood, respectively. For children aged 3 years or older, the dosage for complete protection after exposure of from one to four days is 10 cc., 30 to 40 cc. or 75 to 100 cc. If exposed from five to seven days, the same child should receive from 15 to 20 cc., 30 to 50 cc. or 100 to 150 cc. For production of a modified form of measles, one third to one half of these doses is given.

4. Of our seventy-seven patients exposed to measles, three not treated had typical cases of measles, eleven of sixty treated with convalescent serum had a very mild modified form of the disease, and three of fourteen treated with adult blood or serum had more severe forms of the modified disease. Two of the latter three received transfusions from donors who never had had measles.

5. Three patients who had the modified form of measles after injections of convalescent serum and who were reexposed two months later remained protected. Four of those treated with adult blood or serum, one who had the modified form of measles and three who were completely protected were likewise reexposed after two months, and remained protected.

6. The longest period of prophylaxis by transfusion which protected completely was one month in two cases and three weeks in another. Transfusion on the fifth day after exposure also caused complete passive immunity in two cases.

7. Two children who received blood transfusions from parents that never had had measles, and who were later exposed, had a modified course with prolonged incubation.

8. The modified form of measles varied from that so mild that ordinarily it would not be recognized as measles to that almost as severe as the usual course. Modified measles is characterized by prolonged incubation periods of from twelve to thirty-one days, mild or absent invasion period clinically, mild or absent coryza and photophobia, none or few Koplik spots (hemorrhagic in four cases) lasting from two to four days, and in three patients spots on the tonsils and soft palate with high temperature, as in follicular tonsillitis, mild prodromal rash, absent or scanty eruption, very mild constitutional reactions and no perceptible complications. The general status during the modified form of measles is strikingly good as compared to that of the usual type.

9. The work of DiCristina and Caronia, Tunnicliff, Sindoni and others is encouraging. Until this work has been absolutely adopted, however, the best way to prevent measles or to modify its course is by the use of convalescent serum, or, if this is not available, by the use of adult serum or whole blood.

STUDIES IN SCARLET FEVER

II. THE PROPHYLAXIS OF SCARLET FEVER*

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Since August, 1924, we have been testing all of the employed personnel, including nurses and physicians, who have come to the Cleveland City Hospital for training in the contagious disease department. Dick tests have been made under various conditions, and we have found that for all practical purposes a control test may be made with boiled toxin (boiled for twenty minutes), which will not cause any pseudoreaction persisting after twenty-four hours, and that, in general, persons with negative Dick tests have negative reactions for at least eighteen months.

ACTIVE IMMUNITY

The next series of experiments, which ran concurrently with those described in the first paper, were made to find out how soon active immunity was established after immunization had begun. The toxins used in the experiments for the first year were received from the Dicks; after that they were received from commercial sources.

EXPERIMENT 1.—This was made to ascertain whether active immunity could be conferred on a person as evidenced by the Dick test.

The persons immunized were nurses, physicians and those over whom we would have some control for at least six months. There was a second group that we would be in contact with for a period of at least three years. In the first group, there were 410 persons; in the second, 163. In addition to these there were seventy-four orphans whom we were able to follow for periods of eighteen months or more. Of the total number of cases—649 in all—632 subjects have been immunized after three injections, the Dick test becoming negative in from eight to thirty-five days after the last injection. In eight, the reaction became negative after an additional injection; in three, after a second series of three more injections, while in four, the reaction was still positive even after three complete injections of toxin.

EXPERIMENT 2.—This was made to ascertain whether immunity could be conferred on persons who were exposed to scarlet fever subsequent to the immunization.

Fifty-five nurses who gave typical 4 plus Dick reactions were selected. Twenty of these were immunized by the usual injection of the Dick toxin in three doses. Their reaction to the Dick test became negative in periods of from twenty-four days to three months following the injections. The remaining thirty-five received injections of sterile saline solution. All of the latter came on duty in the

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contagious division, and were exposed to scarlet fever within the first year after the test was made; all of them contracted scarlet fever, twenty-three of them within five days after beginning work in the scarlet fever ward. Nineteen of the control group were frequently exposed during their training in the contagious disease department, but did not contract the disease. One nurse went through her training in this department without any illness, but subsequently, when working in the medical division, had an erythema which was diagnosed as scarlatina. The Dick test on this nurse on admission was negative. The rash was fleeting and erythematous, and we did not believe the condition was scarlet fever, but we mention it as a possible failure of immunization.

Subsequently, all nurses and orderlies going on duty in the contagious division, or coming in contact with patients with scarlet fever, were immunized against scarlet fever. The first immunizations were made with 650 skin test doses units as the initial dose. This, however, produced such a local reaction that this method was discontinued, and the initial dosage was cut down to 500 units.

EXPERIMENT 3.—This experiment was made to ascertain the reaction in immune and sensitive persons to large skin test doses.

Twelve nurses giving reactions of 4 plus, and six nurses with negative reactions each received an intramuscular injection of 750 skin test doses. The six nurses with the negative Dick reaction had no reaction in this instance. Nine of those giving 4 plus reactions had a generalized reaction after the injection of toxin, starting within ten hours as a local induration, which in fifteen hours became red and swollen, and by the end of the twenty-fourth hour had extended to the entire upper arm, shoulder and elbow. Four hours later, thirty hours in all after the injection, one of the nurses had a typical scarlet fever rash; the next day two had a rash, and the remaining five had marked scarlatinal forms of eruption, in from three to four days after the first injection. In five of these, the reaction was severe enough to cause the subject to be put to bed for two or three days, the temperature being as high as 104 F. in two instances. In the six patients with the rash there was general peeling from the fourteenth to the twenty-first day. The clinical reaction was as severe in these nurses as in any of our patients with scarlet fever, and in two instances it was even more so. Barring information about injections, the diagnosis of scarlatina would have been definite. Nausea and vomiting, general malaise and other symptoms were frequent. Four nurses who were given intradermal injections of scarlet fever antitoxin had general skin reactions, and local blanching occurred in each instance. This reaction following immunization injection was seen subsequently in many other nurses and physicians; it was especially marked in three physicians, one of whom had a definite eruption with immunizing doses as low as 80 skin test units.

The dosage in some packages consists of an initial injection of 500 skin test units. This may be too high in an extremely susceptible person, as with this dose we have noted frequent reactions; in thirty-one instances, the reactions were severe enough to keep nurses off duty for from one to three days.

EXPERIMENT 4.—To find out how long the active immunity lasts was the object of this experiment.

Two hundred and twenty persons were immunized in four groups, and 191, or 86.8 per cent, gave a negative Dick reaction after an average period of from four to eight weeks when our now usual immunizing doses were used, starting at 250 skin test doses. Of these 220 persons, 70 have been followed up after 15 months, and all of them still give negative reactions. There have been two or three persons who have been extremely sensitive to the injection, and the immunizing dose has been cut down; later these subjects were exposed to scarlet fever and did not contract the disease. Some of the most marked reactions to the injections have been of this type. It would almost appear that such persons could not be immunized, as they have as violent reactions after the last injection as they had after the first, even though the dosage had not been increased. It might be that they are sensitive to the protein factor, but immune to the disease.

PASSIVE IMMUNITY

Passive immunity may be attempted, and persons who have been exposed to scarlet fever are sometimes given prophylactic injections of scarlet fever antitoxin. This, however, seems poor policy to us, because the serum sickness that frequently follows is much more severe than the disease itself. Forty-eight such persons were seen during the last year and a half; thirty-four of these had serum sickness, although concentrated antitoxin was used. In three of the thirty-four patients, the serum sickness was extremely severe. The severity of the reaction did not depend on previous injections of foreign protein such as diphtheria toxin-antitoxin, as there had been many persons who had been thus immunized against diphtheria and who had had no reaction when given an injection of scarlet fever antitoxin later.

The usual argument is that the rest of the family should be protected if the disease is a severe one, as possibly all those exposed will have the same severe infection if they contract the disease. Twenty-two families were studied, in each of which one death due to scarlet fever occurred. In two instances, other members of the family died, but the exact diagnosis was in question; in the remaining twenty families, other members, sometimes as many as three or four in one family, developed mild scarlatina. The reverse is also true; some persons have had a mild attack of scarlet fever, and in four instances the disease has infected other members of the family with a severe type of the disease.

The most important thing to know is whether or not an injection of scarlet fever antitoxin will actually prevent scarlet fever. We cite the following instances:

CASE REPORTS

CASE 1.—J. S., a boy, admitted to the hospital on Jan. 23, 1926, had a condition mistakenly diagnosed as scarlet fever. He received a full therapeutic dose of concentrated scarlet fever antitoxin and was admitted to the scarlet fever ward. Ten days later a typical scarlet fever rash broke out, the prodromal symptoms having started two days previously.

CASE 2.—M. M., a girl, aged 17 years, was admitted to the hospital, March 11. She had been placed next to a patient with scarlet fever. On admission she had influenza with a faint erythema, and was not very ill. As her condition was mistaken for scarlatina she received a full therapeutic dose of concentrated scarlet fever antitoxin on the day of admission. Four days later she had some prodromal symptoms, and two days afterward a typical scarlet fever rash broke out, which was extremely toxic in type and was complicated by otitis media. The fever persisted for ten days.

CASE 3.—V. P., a girl, admitted to the hospital on March 6, presumably had had scarlet fever one week before admission. As a routine, she received concentrated antitoxin for scarlet fever on admission. Twelve days later the throat became sore, and the temperature went up to 37.5 C. (99.4 F.). On the fourteenth day, the temperature was 40.7 C. (105.2 F.), and the patient had a typical generalized scarlatinal form of eruption, which later was complicated by bilateral otitis media.

CASE 4.—E. P., a girl, was admitted to the hospital on January 20, as a post-scarlet fever patient, and was given the full therapeutic dose of concentrated scarlet fever antitoxin. The next day she was seen by one of the visiting staff who thought the patient (who had bronchopneumonia) probably had had measles. Twenty-seven days later a typical scarlet fever rash broke out, the patient's temperature going up to 40 C. (104 F.) and not declining until about the tenth day.

CASE 5.—This patient was a child, aged 7 years, who was given 10 cc. of concentrated antitoxin, and who developed scarlet fever within seven days after the injection.

CASE 6.—This patient had chickenpox, and was exposed to a patient with scarlet fever in the admitting room. He was given a full therapeutic dose of concentrated antitoxin, and contracted scarlet fever seven days later, which was complicated by bilateral otitis media.

The active immunity experiments were clear-cut, and a definite difference could be demonstrated between groups of persons who received injections and groups of those who did not. This difference was not seen in those passively immunized.

SUMMARY

In our series of cases, the immunity conferred by active immunization against scarlet fever has lasted for eighteen months.

No definite evidence has developed from our experiences to justify the use of scarlet fever antitoxin as a measure of passive immunity.

STUDIES IN SCARLET FEVER

III. AN ANALYSIS OF SCARLET FEVER CASES UNTREATED BY SPECIFIC SERUMS OR ANTITOXINS *

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Before ascribing marked benefits to any specific therapeutic measure in scarlet fever, it is wise to ascertain the reaction of the untreated person, and the death and complication rate in this type of case. It is wise, also, to try to analyze the causes of death, for perhaps these causes may be so overwhelming that no therapeutic measure would be of any value.

In table 1 we call attention to the morbidity and mortality rates of scarlet fever as compared with those of diphtheria since the year 1912 in the city of Cleveland. It will be noticed that, comparably, the morbidity and mortality rates of diphtheria remain a fairly consistent figure (table 1).

TABLE 1.—*Statistics of the Cleveland Board of Health*

Scarlet Fever				Diphtheria			
Year	Morbidity	Mortality	Per Cent	Year	Morbidity	Mortality	Per Cent
1912	1,479	99	6.7	1912	2,605	166	6.4
1913	1,040	118	11.3	1913	2,868	230	8.0
1914	582	48	8.2	1914	2,392	162	6.8
1915	928	72	7.8	1915	2,030	163	8.0
1916	866	40	4.6	1916	1,909	120	6.3
1917	621	14	2.3	1917	1,880	155	8.3
1918	408	11	2.7	1918	1,371	109	8.0
1919	580	7	1.2	1919	2,117	190	9.0
1920	2,257	68	3.0	1920	1,528	133	8.7
1921	2,357	119	5.0	1921	1,788	187	10.4
1922	2,831	40	1.4	1922	1,802	131	7.2
1923	3,653	58	1.6	1923	1,621	114	7.0
1924	817	11	1.3	1924	1,100	79	7.2
1925	1,004	15	1.5	1925	1,746	138	7.9

A better idea can be gained by a comparison of the death rates of scarlet fever and diphtheria per 100,000 estimated population according to the United States Mortality Statistics of 1922. The figures for the years 1913 to 1922, inclusive, show a gradual decrease in the mortality rate of scarlet fever, with the exception of the year 1921 (table 2). With diphtheria, the death rate is much higher. Even

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* From the Division of Contagious Diseases, Cleveland City Hospital, and the Department of Pediatrics, Western Reserve University.

in 1921, it was 8.5 per 100,000 larger, while in 1918 the diphtheritic death rate was ten times as great as in 1919, almost twenty-seven times as large as the death rate from scarlet fever. The Cleveland mortality rate from diphtheria since 1913 is from 6 to 9 per cent, or averages 7.8 per cent, and represents a high hazard rate for a disease for which we have so specific a treatment, while the mortality rate from untreated scarlet fever since 1922 has not been more than 1.5 per cent, and the general average since 1912 has been 4.2 per cent.

This decrease in mortality rate is not merely local. Pope [1] recently called attention to the fact that there has been "no appreciable change in the recorded morbidity in scarlet fever in Providence or in American cities as a whole, during the past forty years. In Providence, attack rates have remained practically constant in all age groups except in infants, where a significant downward trend is noted." He further states that "although the morbidity of scarlet fever has remained prac-

TABLE 2.—*Death Rate Per 100,000 Population (Latter Estimated)* *

Registered Areas of U. S. A., exclusive of Hawaii	Years										Average
	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	
Scarlet fever...	8.7	6.6	3.6	3.3	4.2	3.0	2.8	4.6	5.3	3.5	4.5
Diphtheria.....	18.9	17.9	15.7	14.5	16.6	13.9	14.7	15.3	17.7	14.6	15.9
Cleveland											
Scarlet fever...	18.8	7.7	10.6	5.8	2.0	1.4	0.9	8.5	14.4	5.0	7.5
Diphtheria.....	35.2	24.5	23.6	17.8	20.9	14.0	24.1	16.2	22.9	15.7	21.4
(Corrected)†	35.8	24.3	23.6	16.8	21.0	14.3	24.2	16.4	22.5	15.3	

* United States Mortality Statistics, 1922.
† Last line represents final figures according to the annual report of the Division of Health, City of Cleveland.

tically constant since 1895, the mortality rates in Providence have fallen from approximately forty to two per 100,000. The decline has been equally remarkable in most American cities; where scarlet fever in Providence formerly was responsible for 5.3 per cent of all deaths, it is now the recorded cause of 0.3 per cent of total deaths." The case fatality percentage likewise shows a consistent decrease for the last ten years.

The hospital for contagious disease in any large center receives the greatest proportion of the most severely ill patients with scarlet fever. Even with this in mind, one finds that the hospital morbidity and mortality rate of scarlet fever in the last four and one half years has been (table 3) extremely low—not more than 1.2 per cent in metropolitan Cleveland in any of these years, and not more than 3.2 per cent inside the hospital. Actually, the average mortality rate outside the hospital was 0.84, figuring 1926 as a half year, and 3.2 per cent inside the hospital.

1. Pope, Alton S.: Studies on the Epidemiology of Scarlet Fever, Am. J. Hyg. **6**:389 (May) 1926.

It would seem that there is a hazard rate with every disease beyond which, all things being equal, the situation could not be improved, except by definite new methods of therapy the results of which are unquestioned. The hazards of scarlet fever will become clear when the causes of death in the patients seen are examined, and when the complicating factors and the types of complications most predominant in the patients who die are examined. If these cases could be compared with cases of scarlet fever in which treatment by serums or antitoxins has been used, the group study could serve as a negative untreated control group.

The statement may be made that scarlet fever occurs in cycles of viciousness, and that patients are now experiencing a mild type of disease not comparable in any way to the marked toxic form that occurs during some years. Even if this were true, one could at least compare the real toxic cases of the epidemics of the past few years and note what effect, if any, antitoxins have on the course of this infection.

TABLE 3.—*Morbidity and Mortality Statistics, Jan. 1, 1922 to June 1, 1926*

	City of Cleveland (Total)				Cleveland City Hospital Contagious Division				
			Mortality Outside Hospital			Mortality in Hospital			
Year	Total Morbidity	Morbidity Less Hospital Cases	No. of Cases	Per Cent	Morbidity	No. of Cases	Per Cent	Per Cent of Mortality Dying in Hospital	Total Mortality Rate, Per Cent
1922	2,831	2,339	25	0.1	492	15	3.0	37.5	1.4
1924	817	630	5	0.7	187	6	3.2	54.5	1.3
1925	1,004	682	6	0.8	322	9	2.7	60.0	1.4
1926 (to June 1)	1,491	1,081	14	1.2	410	10	2.4	41.6	1.6

In all the untreated cases at the City Hospital (1,658) during the last five years, there were 1,321 patients who did not have any complications. The remainder (337, or 20.3 per cent) had complications, the most frequent of which were otitis media—which may occur early or late, but usually early in the course of the disease—and adenitis. The specific complications and the number of occurrences are contained in table 4. The total complications and the day of onset after admission to the hospital are contained in table 5. The majority of complications occur after the eighth day, when, theoretically, most patients should have sufficient antibodies to cause a negative Dick reaction.

Chart 1 shows the incidence curves of the total of all complications compared with some of the more common ones such as otitis media, adenitis, arthritis and nephritis.

Chart 2 again shows the total complication curve, but this time the curve of otitis media and adenitis are combined, giving a relative high peak. Two other complications, diphtheria and bronchopneumonia, are

TABLE 4.—*Complications; Frequency—Untreated Cases—From January, 1922, to June, 1926*

1,658 Cases; 331 Cases with 570 Complications

	Number		Number
Abscesses	15	Mediastinitis	1
Adenitis, nonsuppurative	80 (1?)	Meningitis	3
Adenitis, suppurative	19	Mitral insufficiency	0 (1?)
Alveolar abscess	1	Myocarditis, acute	0 (1?)
Anaphylaxis:		Myringitis	1
Edema of glottis	1	Nephritis	39 (1?)
Lung	2 (1?)	Nephritis, chronic	2
Anuria	3	Osteomyelitis	1
Appendix, ruptured or gangrenous	3	Otitis media	148
Arthritis, 1 of these purulent (suppurative)	26	Paralysis of the sixth cranial nerve (3 left, 1 right side)	4
Asthma, bronchial	1	Paronychia	8 (1?)
Blepharitis	1	Pelvic abscess	1
Brain abscess	2	Pericarditis	1
Bronchitis	6	Perichondritis	1
Bronchopneumonia	14	Peritonsillar abscess	13
Lobar	3	Pleurisy with effusion	2
Burn, second and third degree	2	Postpalatine paralysis	1
Cardiac or circulatory failure	8 (?)	Postpartum	1
Cellulitis	2	Puerperal sepsis	3
Conjunctivitis	3	Purpura simplex	2
Convulsions	1	Pyelitis	3
Dacryocystitis	2	Retention	0
Diphtheria	47 (2?)	Scalp abscess	1
Empyema	3	Scleroderma	1
Encephalitis, hemorrhagic	3	Septicemia	13
Endocarditis	1	Sinusitis	10
Erysipelas	2	Sinus thrombosis	3
Herpes simplex	1	Tachycardia, persistent	1
Herpes zoster	1	Thrombophlebitis	1
Hordeolum	1	Toxemia	10
Inanition	4	Ulceration of tongue	1
Jaundice, acute catarrhal	2	Uremia, acute	3
Laryngitis, acute	3	Ureteritis	1
Mastoiditis	19	Vincent's angina	1
Measles	2		

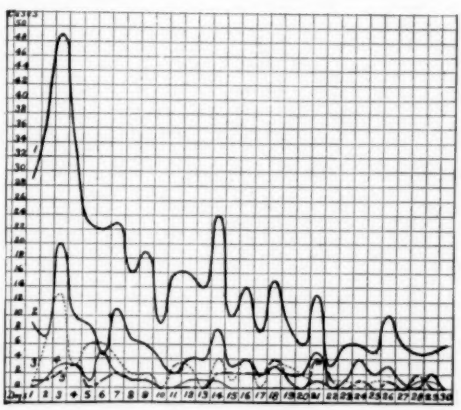

Chart 1.—Incidence curves of all complications compared with some of the more common ones. *1* indicates a total of all complications; *2*, otitis media; *3*, adenitis; *4*, arthritis, and *5*, nephritis.

plotted. Calculations in charts 1 and 2 begin after the patient's admission to the hospital.

The question of nephritis in these statistics was important, in that it was essential to decide just how severe the condition had to be before this diagnosis could be made. One hundred cases were studied in 1913. Daily specimens were taken and centrifugalized for thirty days. In every instance during the course of the patient's stay in the hospital, there was at some time some albumin in the urine, which ranged from the faintest possible trace to more than 4 plus, from a fleeting to a persisting reaction which lasted from three to eleven days.

In these statistics we have ignored the presence of a slight trace of albumin, and have included only those in which a definite albuminuria was seen; i. e., cases in which there were numerous casts with or without red and white cells. In the majority of instances, the casts were always accompanied by a great number of white cells.

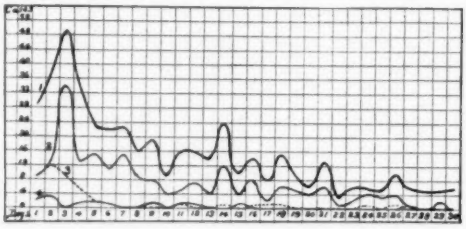

Chart 2.—The total complication curve, combining the curve of otitis media and adenitis. *1* indicates a total of all complications; *2*, otitis media and adenitis; *3*, diphtheria, and *4*, bronchopneumonia.

Many cases of mastoiditis have developed with typical symptoms, but we have seen twelve patients during the last four years in whom when the mastoids were opened pus was found although the ear drums had not ruptured. In these twelve patients there were no localizing symptoms of mastoiditis prior to operation, such as tenderness or other symptoms. We had operations performed because the septic temperature persisted and the nose was filled with pus; otherwise, the physical examination was negative.

There was not enough good evidence from the histories studied to draw any definite conclusions as to the amount of toxemia present in patients admitted to the hospital who did not die. For that reason the number of toxemias in the normal group is ridiculously low. Degrees of toxemia received more attention when death became a possibility, and later as antitoxin was being used.

Another figure which must be explained is the incidence of pyelitis. One is struck by the number of patients with scarlet fever in whose urine pus cells may be found, especially when there is an associated

adenitis. This condition occurred so frequently that no diagnosis of any genito-urinary disturbance was made unless the pus persisted after ten days or was associated with symptoms. If we had counted as pyelitis all cases in which pus cells were found in the urine, then practically every case in the hospital would have been included to a greater or lesser degree in that category at some time during the course of the patient's thirty days stay in the hospital.

Authors have frequently called attention to endocarditis as a cardiac complication. This has not been our experience. In no instance in four and one half years did we see a case in which an endocardial lesion had developed as a result of scarlet fever (one was questionable). There have been, however, patients admitted to the hospital with definite histories of previous endocarditis in whom the endocarditis seemed aggravated by the disease in question. Frequently patients have been admitted in whom cardiac enlargement could be definitely demonstrated. Myocarditis is probably a more common complication.

In a consideration of the causes of death, we included some patients who had been treated with scarlet fever antitoxin. Since more than 350 patients were treated and a second negative control of fifty patients was run concurrently, the total number to be considered for percentage purposes would be 1,658 untreated plus the second control group of fifty, plus the 350 patients treated, or 2,058 patients in all. We shall not discuss the effect of antitoxin at this time, wishing merely to call attention to the method of arriving at percentage computations in this statistical study.

We have taken a list of all the patients who have died from Jan. 1, 1922, to June 1, 1926, and we have tried briefly to analyze the most important clinical facts about their condition in a set of tables (tables 6, 7, 8, 9 and 10). Following each name we have placed (in parentheses) a code number which is understandable on referring to table 11. Thus a person with the numeral 4 following the name would indicate one who had scarlet fever plus diphtheria, etc.

The incidence of toxemia in this group was extremely low (eleven), 16.9 per cent of the sixty-five deaths, in more than 2,000 cases. Prolonged complications peculiar to scarlet fever occurred in 29.2 per cent of the patients.

Virulent diphtheria which was proved positive by guinea-pig inoculation (table 6) was present in 20 per cent of the patients who died; 6.1 per cent were in the class known as unfavorable risks; that is, children who had had one or more serious illness just before contracting scarlet fever.

There were two cases, or 3 plus per cent, in which the diagnosis was questionable.

TABLE 5.—*Total Complications and Day of Onset*

	Day of Disease																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Abscesses	..	..	..	..	..	..	..	1	1	1	2	..	1	2	..	1	..	2	..	..	..	..	..	..	..	..	..	1	..	..	1, 47th day; 1, 77th day; 1, 95th day	15
Adenitis, nonsuppurative	..	6	13	3	5 & 1?	6	6	2	2	..	3	3	..	4	1	4	1	3	3	2	1	1	1	1	1	1	1	1	1	2	1, 40th day	80
Adenitis, suppurative	..	..	..	..	..	1	..	..	..	..	1	..	..	1	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	1, 44th day; 13, ? day; plus 10 cases dates unknown	29
Alveolar abscess	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1, 38th day	1
Anuria	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2, ? day; 1, 37th day	3
Appendix, ruptured	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3, ? day	3
Arthritis	..	1	3	3	1	5	2	1	1	..	..	1	1	1	..	..	..	..	..	1	..	1	..	1	..	..	1	..	1	1		25
Arthritis, suppurative	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1, 40th day	1
Asthma, bronchial	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		1
Blepharitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1		1
Brain abscess	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1, 50th day	2
Bronchitis	1	1	..	..	1	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1, 58th day	6
Bronchopneumonia (3 lobar)	2	3	..	1	1	1	..	..	1	..	1	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1, 37th day; includes 3 lobar pneumonia	17
Burn, third degree	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		1
Burn, second degree	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		1
Cellulitis	..	..	..	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		2
Conjunctivitis	..	1	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		3
Convulsions	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1, ? day	1
Dacryocystitis	..	1	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		2
Diphtheria	9	12	9	6	2	1	..	..	..	..	1	..	..	1	..	1	1	1	..	..	..	..	..	1	..	1?	..	..	..	2	1?, 33d day	49
Encephalitis, hemorrhagic	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1, ? day	1
Endocarditis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..		1
Empyema	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2 ?	3
Erysipelas	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		2
Herpes simplex	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		1
Herpes zoster	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..		1
Hordeolum	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..		1
Inanition	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	1	..	..	..	1	..	..	..		4
Jaundice, acute catarrhal	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..		2
Laryngitis, acute	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1, ? day	3
Lateral sinus thrombosis	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2, ? day	3

| | | |

TABLE 6.—*Deaths from Scarlet Fever in 1922*

Case	Age	On Admission: How Old Symptoms	On Admission: How Old Rash	Died Days: After Admission	Died Days: After Rash Appeared	Died Days: After Symptoms Started	Nose Discharge: +	Nose Discharge: —	Treatment	Cause of Death	Complications and Comment
B. M. (3-7).....	3	1½	1½	13	14½	14½	4+	..	Symptomatic	Bronchopneumonia, measles ?	Measles
M. B. (3-7).....	5	4	4	3 hr.	3 hr.	4	...	—	Symptomatic	Bronchopneumonia	Bronchopneumonia
J. M. (4-7).....	5	3	3	6	9	12	4+	..	Diphtheria antitoxin fifth day	Uremia	Diphtheria, acute nephritis, uremia
W. S. (5).....	9	5	1	3	4	4	...	—	Symptomatic	Acute nephritis, uremia, third degree burn	Acute nephritis; third degree burn; hands, legs and feet; surgical scarlet fever, ill five days before rash appeared
C. G. (2).....	4	2	2	2	2	4	...	—	Symptomatic	Toxemia	Adenitis
E. C. (4-7).....	2½	2	2	2	2	4	4+	..	Diphtheria antitoxin third day	Probable diphtheria	Diphtheria
F. J. (5-7).....	17	3	3	14	14	17	4+	..	Antistreptococcic serum, fifth, eighth and ninth days	Septicemia, peritonitis	Otitis media, adenitis, septicemia and peritonitis
P. C. (2-7).....	39	3	3	2	3	5	3+	..	Streptococcus serum fourth day; adm. 150 cc.	Toxemia (?)	Adenitis
R. G. (6-7).....	3	3	3	26	28	29	4+	..	Symptomatic	Cardiac (?)	Otitis media. Patient had measles three months, pertussis two months, and pneumonia one year ago; he had no fever, no symptoms, fell asleep apparently as usual on evening of January 24; one-half hour later, nurse went to take the temperature at 8 o'clock and found patient dead in his crib
L. H. (5).....	17	4?	4?	2	4	6	...	—	Symptomatic	Sepsis, puerperal	Stillborn delivery first day; lobar pneumonia
L. G. (2-7).....	3½	3	3	1	2	4	4+	..	Symptomatic	Toxemia	Otitis media, convulsions
E. S. (4).....	6	?	?	9	10	?	...	?	Symptomatic	Diphtheria (?)	Bronchopneumonia, diphtheria, adenities, otitis media and herpes. This patient's case was a court case, neglected, forced into hospital by legal action
F. S.(3-7).....	2½	4	4	7	2	11	4+	..	Symptomatic	Bronchopneumonia	Bronchopneumonia
L. G. (3-7).....	4	14	14	3	15	17	4+	..	Diphtheria antitoxin	Septicemia	Septicemia, nephritis
S. S.	5	35	35	3	38	40?	...	—	Symptomatic	Septicemia, uremia, peritonitis	Acute nephritis, anuria, uremia, peritonitis and septicemia

Accidents occur during the course of a disease. We refer particularly to burned patients contracting scarlet fever, to patients who contracted scarlet fever after a ruptured appendix, to those who developed peritonitis in the course of their disease and to women to whom a child had just been born and who had contracted scarlet fever. There were twelve in all, or 18.4 per cent. The virulent diphtherias, the accidents of the disease, the unfavorable risks, the cases in which the diagnosis was questionable and the possible anaphylaxis cases that occur from antitoxin usage will account for 53.6 per cent of the patients who have died on our service. We have constructed a table of complications of the patients who died (table 12). In table 4 are included all of the complications of the patients who died and those of the living patients. The latter table contains the cases of a few patients who had been treated with serum. With this minor exception, we find that of the entire 1,658 patients there were 331 patients with 570 complications, or

TABLE 11.—*Total Number of Patients Dying from January, 1922, to June, 1926*

Year	1 Anaphylaxis or Result of Antitoxin	2 Toxemia	3 Prolonged Scarlet Fever	4 Scarlet Fever and Virulent Diphtheria	5 Accidents of Disease, Puerperal, etc., Burns, Appendix	6 Bad Risks	7 Questionable Diagnosis	8 Sinusitis with Plugged Nose
1922.....	0	3	4	3	4	1	0	9
1923.....	0	5	7	5	5	2	1	17
1924.....	0	1	1	1	2	1	0	2
1925.....	1	1	4	2	1	0	0	5
1926.....	3	1	3	2	0	0	1	8
Total.....	4	11	19	13	12	4	2	41
Percentage.....	6.1	16.9	29.2	20.0	18.4	6.1	3+	63+

a general average of 1.7 per patient. The sixty-five patients who died had 153 complications, or 2.3 per patient. Correcting these figures, we find that there were 266 patients living who had 417 complications, or 1.5 per patient.

A clinical complication that is not stressed enough is the plugged nose (probably in every patient with sinusitis) occurring in a high percentage of the patients who died. Forty-one (one questionable) of the sixty-five, or 63 plus per cent (nine of the eleven patients who died of toxemia and nineteen, or all of those who died after prolonged scarlet fever) had marked nasal discharge on admission. In our experience, this is the most ominous early complication in scarlet fever, and although it is true that many patients do not die who have plugged noses, nevertheless the high percentage of deaths with this complication is significant. Especially in this complication significant in patients with high arched and narrow palates and crowded teeth (a possible rachitic remnant of infancy and childhood).

Forty of the sixty-five patients, or more than 60 per cent, died on or after the eighth day after symptoms started, after a period of time when,

TABLE 7.—*Deaths from Scarlet Fever in 1923*

Case	Age	On Admission: How Old Symptoms	On Admission: How Old Rash	Died Days: After Admission	Died Days: After Rash Appeared	Died Days: After Symptoms Started	Nose Discharge: +	Nose Discharge: —	Treatment	Cause of Death	Complications and Comment
H. G. (3-7).....	1½	6	2	8	10	14	4+	..	Transfusion of convalescent scarlet blood	Septicemia 14th day	Adenitis, otitis, sinusitis and septicemia
M. S. (4).....	8	3?	?	1	?	4	—	—	Diphtheria antitoxin	Probable diphtheria	Sister had diphtheria, temperature up to 41.4 C.
A. P. (6-7).....	4	7	4	1	5	8	4+	—	Symptomatic	Acute uremia	Acute uremia; had nephritis four months
R. D. (3-7).....	2½	14	?	6	?	20	4+	—	Symptomatic	Bronchopneumonia	Mother and father with disease; bronchopneumonia, positive cultures
R. T. (2).....	3	2	Same day	3	3	5	—	—	Symptomatic	Toxemia, circulatory failure	Otitis, conjunctivitis; sister died two days before
G. K. (3-7).....	29	9	7	Same day	7	9	4+	—	Symptomatic	Pneumonia	Otitis, arthritis and pneumonia
C. Z. (3-7).....	5	6	1	2	3	8	4+	—	Symptomatic	Septicemia (?)	Adenitis, septicemia, was diagnosed diphtheria ?
E. I. (4-7).....	5	3	Same day	7	7	10	4+	—	Diphtheria antitoxin	Cardiac toxemia (?)	Diagnosed diphtheria second day; rec. ant. acute nephritis; cardiac death
H. S. (2).....	25	3	15½ hr.	1	39½ hr.	4?	—	—	Symptomatic	Toxemia	None
C. C. (5-7).....	12	8	4	2	6	10	4+	—	Operation, drainage	Peritonitis	Ruptured appendix, peritonitis, acute nephritis, fibrinopericarditis
K. R. (8-7).....	2½	7	3?	10	13	17	4+	—	Symptomatic, had antitoxin before admission	Bronchopneumonia	Three doctors, one measles, one bronchopneumonia, one diphtheria; otitis, bronchopneumonia, conjunctivitis, multiple abscesses
V. M. (2).....	2½	2	18 hr.	1	1¼	3	—	—	Symptomatic	Toxemia	None
S. D. (2-7).....	4	5	?	3 hr.	?	5	4+	—	Symptomatic	Toxemia	Rickets, acute nephritis
E. G. (5).....	37	3	3	2	5	5	—	—	Symptomatic	Puerperal	Bronchitis, cardiac dilatation. Delivered of baby three days before admission; question of puerperal sepsis

O. S. (3-7).....	4	6	4	13	17	19	4+	—	Convalescent serum 2 times, transfusion once	Brain abscess	Otitis media, adenitis and brain abscess
W. A. (5).....	19	1	1	1	2	2	—	—	Convalescent serum	Acute nephritis, second degree burn	None. Had extensive second degree burn seven days before scarlet fever started
I. S. (6).....	6	1	1	17	17	17	—	—	(See Comment)	Acute nephritis, hemorrhagic encephalitis	Admitted as diphtheria twenty-four days before cross-infection of scarlet fever and varicella; was better till then; had had virulent diphtheria three days before antitoxin was administered
D. H. (4-7).....	6	6	2	3	5	9	4+	—	Diphtheria antitoxin	Cardiac (?), diphtheria	Otitis media, nasopharyngeal diphtheria with scarlet fever; diphtheria antitoxin sixth day; adenitis
C. U. (4-7).....	15 mo.	9	?	5 hr.	?	9	4+	—	Convalescent scarlet fever serum	Diphtheria	Had positive virulent nasal diphtheria; cultures from discharge
A. W. (5-7).....	11 mo.	1	1	4	4	4	3+	—	Symptomatic	Toxemia	Admitted twenty-three days before scarlet cross-infection; had varicella, bronchitis, phimosis, otitis and marked rickets
D. B. Mc. (4-7)...	2	14	12	7	19	21	4+	—	Convalescent serum, diphtheria antitoxin	Cardiac (?), diphtheria	Sick two weeks with scarlet fever, cellulitis of neck, otitis media, abscess of scalp; contracted diphtheria three days before admission; no antitoxin until admission the third day
D. M. (2-7).....	7	6	3	3	6	9	4+	—	Symptomatic	Toxemia	Malignant scarlet fever with petechiae; comatose
A. S. (3-4).....	13	2?	2	23	25	25?	4+	—	Transfusion	Uremia, septicemia	Otitis media, acute nephritis, septicemia and uremia
C. C. (3-7).....	17	3	Same day	50	50	53	4+	—	Mercurochrome	Brain abscess, septicemia	Otitis, bronchitis, multiple abscesses of skin, brain abscess, herpes, purulent meningitis, acute nephritis
C. R. (5).....	11	4	Same day	3	3	7	—	—	Operated on for appendicitis before coming to the hospital	Peritonitis	Pyelonephritis; operated on for appendicitis—one of six such cases we have seen

TABLE 8.—*Deaths from Scarlet Fever in 1924*

Case	Age	On Admission: How Old Symptoms	On Admission: How Old Rash	Died Days: After Admission	Died Days: After Rash Appeared	Died Days: After Symptoms Started	Nose Discharge: +	Nose Discharge: —	Treatment	Cause of Death	Complications and Comment
W. M. (5).....	13	4	1	36	37	40	—	—	Operation	Peritonitis, pelvic abscess, ruptured appendix	The patient did not have any localizing symptoms until December 10; operation was performed the same day, a ruptured appendix was found
E. M. (4-7).....	6	12?	12	5	17	17?	4+	—	Diphtheria antitoxin	Diphtheria	On admission, the diphtheritic membrane was completely plugged in both nostrils; suppurative adenitis
C. K. (3).....	3	7	1?	4	5?	11	—	—	Received some kind of antitoxin outside of hospital	Acute nephritis	Acute nephritis
S. V. (2).....	19	3	1	8	9	11	—	—	Convalescent scarlet fever serum three times; blood transfusion	Toxemia	Necropsy was not allowed; toxic from admission
C. L. (5).....	25	3	1	3	4	11	—	—	Convalescent scarlet fever serum	Sepsis, puerperal	The patient had just been delivered of a child; question of puerperal sepsis
C. J. (6).....	3½	..	..	..	..	..	4+	—	.....	Lobar pneumonia	Cannot use this case definitely. The patient was an idiot admitted as a diphtheritic patient; had pulmonary tuberculosis, otitis media, mastoiditis, and then erysipelas following bronchopneumonia; he later contracted lobar pneumonia and had cross-infection with scarlet fever; died 273 days after admission

TABLE 9.—*Deaths from Scarlet Fever During 1925*

Case	Age	On Admission: How Old Symptoms	On Admission: How Old Rash	Died Days: After Admission	Died Days: After Rash Appeared	Died Days: After Symptoms Started	Nose Discharge: +	Nose Discharge: —	Treatment	Cause of Death	Complications and Comment
E. B. (1).....	6	2	Same day	Same day	Same day	2	—	—	Scarlet fever antitoxin once	Anaphylaxis	Patient was not very ill on admission, was not toxic; edema of lungs
G. F. (5).....	16	3	1	16	17	19	—	—	Appendectomy	Septicemia, acute nephritis, peritonitis	Operated on day after admission; acute gangrenous appendix found; transient abdominal pain started thirty-six hours before admission
L. O. (3).....	7	21	21?	2	23?	23	?	?	Transfusion	Septicemia, sinus thrombosis	This patient had mastoiditis; operation for otitis media performed at home, and had the left jugular tied off for a sinus thrombosis also at home, and was then brought to the hospital
M. C. (3-4).....	20	2	Same day	10	10	12	4+	—	Scarlet fever antitoxin, three full doses	Cardiac (?)	Sinusitis. The patient was given scarlet fever antitoxin on the first, third and fifth days; she was a nurse and had always had a stuffed nose, and had always refused operative relief
M. I. (4-7).....	4	7	4?	4	8?	11	4+	—	Symptomatic; diphtheria antitoxin had been given outside hospital	Uremia, bronchopneumonia, diphtheria	The patient had congenital syphilis and chronic nephritis for months; cultures from nasal discharge showed virulent diphtheritic bacilli
M. C. (4-7).....	Infant	6	1	1	2	7	4+	—	Diphtheria antitoxin	Toxemia, diphtheria (?)	On admission, the patient had typical diphtheritic membrane and marked adenitis as well as a fresh scarlet fever rash
E. P. (3-7).....	32	8	4	18 hr.	5¼	9¼	4+	—	Symptomatic	Septicemia (?)	Sinusitis. This patient was a physician, who always had nasal obstruction, and always put off operative relief; only slight water intake for three days
M. G. (3).....	Infant	6?	6	3	9	9?	—	—	Symptomatic	Lobar pneumonia	Had suffered a great water loss before admission
M. M. (2-7).....	8	3?	3	10 hr.	3 10 hr.	3 10 hr.?	3+	—	Symptomatic	Toxemia	Was an idiot, whose neck became swollen three days before admission, on the day disease was supposed to have started; probably had it longer

TABLE 10.—*Deaths from Scarlet Fever During 1926*

Case	Age	On Admission: How Old Symptoms	On Admission: How Old Rash	Died Days: After Admission	Died Days: After Rash Appeared	Died Days: After Symptoms Started	Nose Discharge: +	Nose Discharge: −	Treatment	Cause of Death	Complications and Comment
L. B. (3).....	3	19?	19	27	46	46?	—	—	Transfusion 3 times gentian violet, incision of abscess, scarlet fever serum day of rash intramuscularly	Septicemia, purulent meningitis	Urticaria with swollen joints six days after antitoxin, bronchopneumonia, multiple abscesses, purulent meningitis, septicemia; a sister was all right, no serum given
R. J. (4-7).....	5	10?	10	34	44?	44?	4+	—	Diphtheria antitoxin, operation for empyema, incision of abscess, transfusion 3 times	Septicemia	Mediastinitis, bilateral empyema, otitis media, cellulitis of neck. The patient had scarlet fever and was getting better when, two days before admission, the glands became swollen; typical diphtheritic membrane on admission, later glands broke down
F. J. (1).....	31	4	1	5 hr.	29 hr.	4 29 hr.	—	—	Scarlet fever antitoxin intravenously	Anaphylaxis	Edema of lungs. The patient was sick on admission, but not enough to give bad prognosis; one hour after antitoxin had chills, became cyanotic and stayed so; the lungs filled up with mucus
J. W. (1-7).....	10	1	Day of admission	3	3	4	4+	—	Scarlet fever antitoxin, intravenously	Anaphylaxis (?)	The patient's temperature was 37.5, after antitoxin went up to 41.5; delirious and semicomatose; never completely aroused after that
B. E. G. (3-7).....	5	14	Day of admission	4	4	18	4+	—	Double mastoidectomy, scarlet fever antitoxin	Septicemia (2)	The patient's illness and sore throat started fourteen days before admission; right facial paralysis on admission; rachitic
M. E. P. (8-7)....	4½	3?	1	4	5	8?	4+	—	Scarlet fever antitoxin third day	Bronchopneumonia	Questionable diagnosis
R. S. (1-7).....	33	4	Day of admission	3	3	7	+	—	Scarlet fever antitoxin intravenously	Cardiac weakness, anaphylaxis (?)	The temperature came down and the patient was better, but developed serum sickness on the third day; became cyanotic, delirious and comatose; had edema of glottis, after tracheotomy felt relieved; became conscious and cyanosis disappeared; four hours later died suddenly without any distress
E. W. (3-7).....	5	4?	4	2	6	6?	4+	—	Scarlet fever antitoxin intramuscularly	?	K. L. found on smear, not virulent for guinea-pigs. The patient had measles and pneumonia four months ago; rickets; nose plugged
K. D. (4-7).....	11	7	6	1	7	8	4+	—	Scarlet fever antitoxin intramuscularly first day of rash, diphtheria antitoxin seventh day	Cardiac, acute dilatation; diphtheria	Organisms from membrane virulent for guinea-pigs. May 10, typical rachitic mouth, high arched palate; the nose filled with discharge; had frequent trouble; mastoidectomy six months previously; diphtheritic membrane on admission
J. W. (2-7).....	7	2	1½	15	16½	17	4+	—	Scarlet fever antitoxin intramuscularly	Meningitis, purulent	Otitis, mastoiditis, meningitis, acute nephritis

theoretically, sufficient antitoxin had been formed. Dick tests were made on eleven of the patients who died. In seven, the reaction was negative at from the ninth to the nineteenth day after the disease. The remaining four patients died on or so near the eighth day that our results were useless. The curious thing is that the patients manufactured sufficient

TABLE 12.—*Complications of Sixty-Five Patients Dying of Scarlet Fever* *

	1922	1923	1924	1925	1926	Total.
1. Abscess of scalp	0	1	0	0	0	1
2. Adenitis, nonsuppurative	4	4	0	0	0	8
3. Adenitis, suppurative	0	0	1	0	1	2
4. Anaphylaxis	0	0	0	0	1	1
(a) Edema of glottis	0	0	0	0	1	1
(b) Edema of lung	0	0	0	1	1	2
(c) Urticaria	0	0	0	0	0	0
5. Anuria	1	0	0	0	0	1
6. Appendix, ruptured	0	1	1	1	0	3
7. Arthritis	0	1	0	0	0	1
8. Brain abscess	0	2	0	0	0	2
9. Bronchitis	0	2	0	0	1	3
10. Bronchopneumonia	4	3	0	1	2	10
11. Burn, second degree	0	1	0	0	0	1
12. Burn, third degree	1	0	0	0	0	1
13. Cardiac failure	0	0	0	0	2	2
14. Cellulitis of neck	1	0	0	0	0	1
15. Circulatory failure	0	0	0	0	0	0
16. Congenital syphilis	0	0	0	1	0	1
17. Conjunctivitis	0	2	0	0	0	2
18. Convulsions	1	0	0	0	0	1
19. Diphtheria	3	5	1	2	2	13
20. Empyema, bilateral	0	0	0	0	1	1
21. Encephalitis, hemorrhagic	0	1	0	0	0	1
22. Herpes	1	1	0	0	0	2
23. Inanition	0	0	0	1	0	1
24. Lobar pneumonia	1	0	1	1	0	3
25. Mastoiditis	0	0	0	1	2	3
26. Measles	1?	0	0	0	0	1?
27. Mediastinitis	0	0	0	0	1	1
28. Multiple abscesses	0	2	0	0	1	3
29. Nephritis, acute	4	7	1	1	1	14
30. Nephritis, chronic	0	1	0	1	0	2
31. Otitis media	4	8	0	1	2	15
32. Paralysis of right facial nerve	0	0	0	0	1	1
33. Pelvic abscess	0	0	1	0	0	1
34. Pericarditis	0	1	0	0	0	1
35. Peritonitis	2	2	1	0	0	5
36. Petechiae	0	0	0	0	0	0
37. Puerperal sepsis	1	1	1	0	0	3
38. Purulent meningitis	0	1	0	0	2	3
39. Pyelonephritis	0	1	0	0	0	1
40. Rickets	0	1	0	0	0	1
41. Septicemia or sepsis	3	4?	0	3?	3?	13
42. Sinusitis	0	1	0	2	0	3
43. Sinus thrombosis	0	0	0	1	0	1
44. Toxemia	3	5	1	1	0	10
45. Uremia	3	2	0	1	0	6
46. Urticaria	0	0	0	0	0	0
Total						173

* A few complications not strictly the result of scarlet fever are included in all tables.

antitoxin to give them a negative Dick test, but this did not prevent the development of complications and subsequent death.

A most important factor, which has been ignored greatly, is the interval between the time the illness started and the appearance of the rash. This has been extremely variable, sometimes lasting as long as seven days. We have no definite figures on which we can place much reliance at this time, but our impression is that most patients with scarlet

fever are sick at least two days and in some instances as long as seven days before the rash appears. Theoretically, then, antitoxins to be of any great value should be given before the rash breaks out or, in other words, at a time when it is impossible to make a definite diagnosis. After the rash appears, the majority of patients are well on the road to recovery. The dictum that the patient is never sicker than he is at the height of the rash is, with some exceptions, a fair estimate of the situation.

In chart 3, the causes of death are plotted. Many of the patients had two or more complicating factors, any one of which might cause death; hence, the arithmetical figure of addition of complications of this grouping would be larger than the actual number of deaths. In another part of the same chart, the actual number of patients who had nasal discharge and the amount of discharge are plotted.

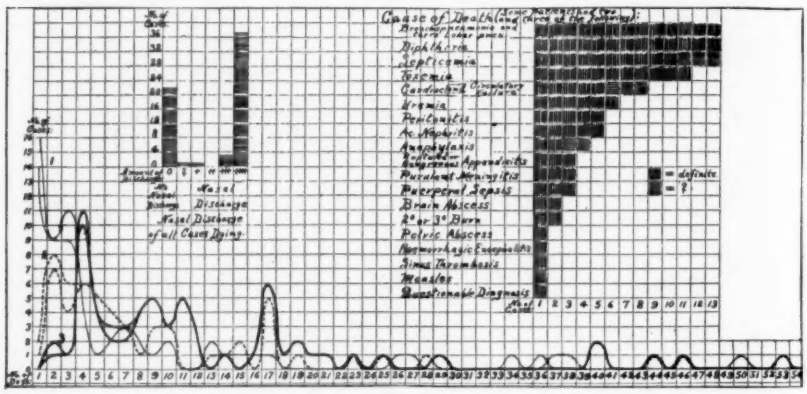

Chart 3.—Curves of onset of death. *1* indicates admission to hospital; *2*, appearance of rash, and *3*, beginning of symptoms.

The curves of death after admission are sharp, and persist from the first to the fourth day (chart 3). After the symptoms begin, this curve is at its peak on the fourth day. The peak after the rash appears is on the second day, which may or may not be the second day after the beginning of symptoms.

In curve 3 (chart 3) there are two peak lines drawn. The larger peak represents the curve which would prevail if we included those patients who died after the administration of antitoxin. The lower peak is the curve if we excluded those deaths. It will be noticed that deaths occurred, strung out after long periods, until the fifty-fourth day afterward.

In this group, there is only one patient with sinus thrombosis who died, although we had three in the last five years, two of whom have lived, one of whom had otitis media, mastoiditis, subdural abscess, sinus

thrombosis, jugular thrombosis, septicemia (blood culture positive four times) and multiple abscesses (no antitoxin was given).

SUMMARY

In an analysis of 1,658 scarlet fever cases occurring in the Cleveland City Hospital, Division of Contagious Disease, the mortality rate in untreated patients is extremely low.

The patients who died had complicating factors which might have caused death even though scarlet fever antitoxin had been given.

TRANSFUSED BLOOD IN INFANTS WITH SEVERE MALNUTRITION *

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During recent years, blood transfusion has been widely used in the treatment of severe malnutrition. The general impression is that this form of therapy is beneficial in many conditions, yet little is known regarding the manner in which it exerts its favorable action. This study represents an attempt to establish some rational basis for the treatment. The total volume of blood before and after transfusion was estimated to learn what change in the bulk of the circulating fluid had occurred and whether it was due to change in the volume of plasma or to corpuscles, or to both. The serum proteins and the hemoglobin were also estimated.

It has been suggested that antibodies pass from donor to recipient during transfusion, and hence blood from immunized persons has been used in the treatment of sepsis. The only antibody-like substances available for study in any quantity are the iso-agglutinins. Though the cells of new-born infants contain agglutinogen, the serum, unlike that of adults, frequently does not contain agglutinin. The iso-agglutinin titer of the recipient serum before and after transfusion was therefore measured to determine whether iso-agglutinins from the donor had remained in the plasma.

PROCEDURE AND METHODS

The plasma volume, corpuscular volume, hemoglobin percentage, serum protein percentage and iso-agglutinin titer of the recipient's blood were determined before and at repeated intervals after the transfusion. The volume, hemoglobin content, serum protein percentage and iso-agglutinin titer of the specimen of blood injected were also estimated.

The citrate method of transfusion was used. Blood was drawn from the donor into a large, wide-mouthed bottle containing a 2 per cent solution of sodium citrate. One part of citrate solution was used to nine parts of blood, so that the resulting concentration of citrate in the injected blood was 0.2 per cent.

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Approximately 20 cc. of blood per kilogram of body weight was given by gravity. A measured amount of saline solution was first injected. The longitudinal sinus was used for all the transfusions. Local ill effects were never observed, although transfusions have been made in numerous infants by us in this manner. Blood for hemoglobin determination of the donor was removed from the wide-mouthed bottle after careful mixing, and a calculation was made for dilution by the citrate solution. Blood for serum protein determination and iso-agglutinin titer was obtained directly from the collecting needle without admixture with citrate. Specimens of blood for hemoglobin, serum protein and iso-agglutinin determinations were obtained from the toe capillaries of the infant. The determination of the blood volume was made immediately before the transfusion. Capillary blood was used for all subsequent determinations except blood volume.

In infants, reactions following transfusion are not common and, when present, are usually of a mild nature, consisting for the most part of a rise in temperature. An attempt was made to determine whether a dialyzable toxic substance was present in the plasma of the infants showing reactions. At the time of each transfusion, 20 cc. of citrated donor's blood was put aside. If a reaction occurred, the citrated plasma was dialyzed against water for twenty-four hours, the dialysate was evaporated down to a small volume at 45 C., and the residue was injected intraperitoneally into a guinea-pig. In the four cases studied in this way, the guinea-pigs showed no reaction. It is possible that these data are not entirely applicable to infants.

The Palmer [1] method was used for estimating the hemoglobin percentage. Since discrepancies often occur between the hemoglobin of capillary and venous [2] blood, all specimens were taken from the toe. After the first twenty-four hours, specimens were taken at the same time of day in order to avoid diurnal variations.[3]

The blood volume was determined by a micromodification of the dye method of Keith, Rowntree and Geraghty [4] previously described,[5] which requires only 4 cc. of blood.

The refractometric method was used for estimating the serum proteins. The technic used was similar to that described in previous papers.[6]

The iso-agglutinin titer of serum was determined in the following manner: A 3 per cent emulsion of red cells was prepared from a person whose iso-agglutinin group was known. The accuracy of the

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emulsion was checked by red cell counts. Red cell emulsions from the same person were prepared daily. Varying dilutions of the patient's serum were made with saline solution, and to these an equal quantity of the red cell emulsion was added. The tests were performed macroscopically in small test tubes prepared from 6 mm. glass tubing. The tubes were allowed to stand thirty minutes at room temperature and then read; they were placed in the icebox over night and then read again.

Urobilin was determined by the method of Wilbur and Addis.[7]

CASE REPORTS

CASE 1.—*History.*—B., a boy, aged 9 months, weighing 4.38 Kg., received 62 cc. of blood, 20 cc. of saline solution and 18 cc. of 2 per cent sodium citrate solution. Following the transfusion the temperature rose to 39 C. (102.2 F.). A specimen of the citrated plasma from the blood with which the transfusion had been made was dialyzed, as described in the foregoing, and was injected into the peritoneal cavity of a guinea-pig. The pig remained normal.

TABLE 1 (case 1).—*The Effect of Transfusion on the Blood of an Infant with Severe Malnutrition and Anemia*

Time	Weight, Kg.	Blood Volume, Cc.	Plasma Volume, Cc.	Corpuscle Volume, Cc.	Corpuscles, Percentage	Hemoglobin Content per 100 Cc., Gm.	Serum Protein, Percentage
Before	4.38	492	348	144	29.3	5.9	7.9
After							
½ hour	....	...	...	...	....	9.7	7.7
1 hour	....	...	...	...	....	9.5	7.4
3 hours	....	...	...	...	....	9.2	7.7
4 hours	....	...	...	...	....	8.9	7.7
5 hours	....	513	344	169	32.9	....	....
6 hours	....	...	...	...	....	9.2	7.7
1 day	4.38	486	324	162	33.3	9.3	8.2
2 days	....	...	...	...	....	9.7	....
3 days	....	...	...	...	....	....	8.1
5 days	....	...	...	...	....	....	8.2
7 days	....	...	...	...	....	11.1	....
8 days	....	...	...	...	....	10.2	7.7
10 days	....	...	...	...	....	9.1	7.8
11 days	4.54	533	358	175	32.8	8.5	7.5

Five hours after the transfusion the volume of plasma had returned to its original level. The percentage of plasma proteins was unchanged, indicating that protein as well as plasma fluid had left the circulation. The corpuscles, on the other hand, showed a well marked increase (17 per cent). Twenty-four hours after the transfusion the plasma volume had fallen below its previous level, the corpuscles remaining high. Another series of determinations on the fourteenth day showed an increase in the plasma and cell volume coincident with the improvement in the general condition of the child. The decrease in the hemoglobin percentage observed at this time was relative, and was due to dilution with the increased plasma fluid.

CASE 2.—*History.*—F., a boy, aged 11 months, weighing 5.12 Kg., was pale and emaciated, ate poorly, refused food and vomited large amounts of his feedings.

7. Wilbur, R. L., and Addis, T.: Urobilin: Its Clinical Significance, Arch. Int. Med. **13**:235 (Feb.) 1914. Denzer, B. S., and Merritt, K. K.: Studies on Anemia in Infancy: The Urobilin Content of the Stools of Normal Infants, Am. J. Dis. Child. **27**:297 (April) 1924.

During the period of observation he was receiving whole lactic acid milk. Transfusion was performed, the patient receiving 115 cc. of blood, 30 cc. of saline solution and 10 cc. of 2 per cent sodium citrate solution. The hemoglobin content of the donor's blood was 12.2 Gm. per hundred cubic centimeters; the serum proteins were 7.6 per cent.

As indicated in table 2, the increase in the corpuscular volume twenty-four hours after the transfusion was marked (24 per cent) despite a loss in weight of 200 Gm. There was a slight increase in the plasma volume (4 per cent). The serum protein concentration remained unchanged, but the hemoglobin percentage rose from 9.7 to 11.7 Gm. per hundred cubic centimeters (22 per cent).

TABLE 2 (case 2).—*Effect of Transfusion on the Blood of an Infant with Severe Malnutrition*

Time	Weight, Kg.	Blood Volume, Cc.	Plasma Volume, Cc.	Corpuscle Volume, Cc.	Corpuscles, Percentage	Hemoglobin Content per 100 Cc., Gm.	Serum Protein, Percentage
Before	5.12	546	342	204	37.3	9.7	7.0
After							
1 hour	....	...	...	...	...	11.5	7.6
3 hours	....	...	...	...	....	11.4	7.1
5 hours	....	...	...	...	40.0	10.9	7.0
6 hours	....	...	...	...	....	11.5	7.1
8 hours	....	...	...	...	....	10.4	6.9
10 hours	....	...	...	...	....	....	7.2
12 hours	....	...	...	...	....	11.8	....
21 hours	....	...	...	...	....	11.1	7.0
23 hours	4.91	607	354	253	41.7	11.7	....
40 hours	4.85	...	...	...	....	12.6	7.9
52 hours	....	...	...	...	...	13.2	7.9
56 hours	....	525	298	227	43.2	....	7.6
3 days	4.66	...	...	...	....	13.6	8.6
5 days	4.54	...	...	...	....	13.1	....
9 days	4.40	...	...	...	....	12.0	....
19 days	....	487	271	216	44.0	12.6	7.2

On the following day there was a further drop in weight, this time accompanied by an increase in the serum protein percentage, an increase in the hemoglobin and a fall in the plasma and corpuscular volumes, which was much more marked in the plasma volume. The corpuscles remained higher than before transfusion. The infant continued to lose weight, and nineteen days after the transfusion the plasma and corpuscular volumes had fallen still further. Throughout the period of observation there was a gradual rise in corpuscular percentage, and a general upward tendency in the hemoglobin percentage.

TABLE 3 (case 3).—*Effect of Transfusion on the Blood of an Infant with Severe Malnutrition*

Time	Weight, Kg.	Blood Volume, Cc.	Plasma Volume, Cc.	Corpuscle Volume, Cc.	Corpuscles, Percentage	Hemoglobin Content per 100 Cc., Gm.	Serum Protein, Percentage
Before	3.15	308	209	99	32.8	10.4	....
After							
3 days	3.21	355	223	132	37.2	13.3	....
19 days	3.30	358	222	136	38.0	11.1	....
3 months	4.15	511	325	186	36.4	13.1	....

CASE 3.—*History.*—B., a girl, aged 6 months, was severely marantic. Following the transfusion of 70 cc. of blood, 5 cc. of saline solution and 10 cc. of 2 per cent sodium citrate solution, there was a marked increase in the corpuscular volume (33 per cent) and a slight increase in the plasma volume (7 per cent). The hemoglobin rose from 10.4 to 13.3 Gm. per hundred cubic centimeters.

Nineteen days after the transfusion, the baby had gained 60 Gm., and the plasma and corpuscular volumes remained the same. The baby was discharged from the hospital and was readmitted three months later. Corresponding to the gain in weight, there was a marked increase in plasma and corpuscular volumes.

CASE 4.—*History.*—V., a boy, aged 3 months, was severely marantic. He received 50 cc. of blood, 15 cc. of saline solution and 5 cc. of 2 per cent sodium citrate solution. The serum protein concentration of the donor's blood was 7.4 per cent and the hemoglobin content 10.5 Gm. per hundred cubic centimeters. Five hours after the transfusion, there was a marked increase in both the plasma and corpuscular volumes. The hemoglobin had risen from 5.3 to 7.8 Gm. per hundred cubic centimeters, but the serum proteins remained unchanged. Twenty hours after the transfusion the plasma volume had returned to its original level, but the corpuscular volume showed an increase of over 20 per cent. The hemoglobin had risen to 8.1 Gm. per hundred cubic centimeters.

TABLE 4 (case 4).—*Effect of Transfusion on the Blood of an Infant with Severe Malnutrition and Anemia*

Time	Weight, Kg.	Blood Volume, Cc.	Plasma Volume, Cc.	Corpuscle Volume, Cc.	Corpuscles, Percentage	Hemoglobin Content per 100 Cc., Gm.	Serum Protein, Percentage
Before	2.50	177	143	34	19.3	5.3	4.4
After							
5 hours	....	227	169	58	25.6	7.8	4.2
11 hours	....	...	...	...	....	7.8	4.2
23 hours	2.50	179	137	42	23.5	8.1	3.9
5 days	....	...	...	...	....	8.1	4.4
11 days	....	...	...	...	....	8.6	5.8

CASE 5.—*History.*—C., a boy, was severely marantic. He received 65 cc. of blood, 20 cc. of saline solution and 8 cc. of 2 per cent sodium citrate solution. The hemoglobin content of the donor's blood was 15.9 Gm. per hundred cubic centimeters, the serum protein was 7.9 per hundred cubic centimeters. Five hours after the transfusion, the plasma volume had increased from 252 to 277 cc. (10 per cent), the corpuscular volume from 138 to 185 cc. (34 per cent). There was also a rise in the hemoglobin and in the serum protein percentages. On the following day the hemoglobin had risen still further.

TABLE 5 (case 5).—*The Effect of Blood Transfusion on the Blood of an Infant with Severe Malnutrition*

Time	Blood Volume, Cc.	Plasma Volume, Cc.	Corpuscle Volume, Cc.	Corpuscles, Percentage	Hemoglobin Content per 100 Cc., Gm.	Serum Protein, Percentage
Before	390	252	138	35.3	7.9	4.9
After						
2 hours	...	...	...	....	12.6	5.7
5 hours	462	277	185	39.1	12.5	5.5
24 hours	...	...	...	....	12.6	5.7
30 hours	...	...	...	....	14.6	5.7
34 hours	...	...	...	....	15.0	6.0
26 days	...	...	...	....	12.1	6.5

CASE 6.—*History.*—In this severely marantic infant, aged 4 months, weighing 2.84 Kg., the injection of 60 cc. of blood with a hemoglobin percentage of 13.8 Gm. per hundred cubic centimeters and a serum protein content of 8.5 per cent resulted within twenty-four hours in a marked rise in the corpuscular volume (40 per cent), a slight rise in the plasma volume (8 per cent) and an increase in the serum protein concentration which persisted during the entire period of observation (seven days). The hemoglobin remained unchanged. There was no increase in the urobilin output following the transfusion.

TABLE 6 (case 6).—*The Effect of Blood Transfusion on the Blood of an Infant with Severe Malnutrition*

Time	Weight, Kg.	Blood Volume, Cc.	Plasma Volume, Cc.	Corpuscle Volume, Cc.	Corpuscles, Percentage	Hemoglobin Content per 100 Cc., Gm.	Serum Protein, Percentage
Before	2.84	278	193	85	29.5	14.4	5.2
After							
4 hours	....	...	...	...	....	13.8	5.1
6 hours	....	...	...	...	....	14.7	6.0
12 hours	....	...	...	...	....	14.8	5.6
24 hours	2.84	328	209	119	36.3	13.4	5.6
3 days	2.90	323	214	109	33.8	....	....
6 days	2.96	...	...	...	....	12.5	....
7 days	....	...	...	...	....	14.0	6.3

COMMENT

The therapeutic use of transfusion for infants with malnutrition offers a good opportunity for studying the fate of transfused blood, since in these patients there is, so far as is known, neither overactive blood destruction as in pernicious anemia, nor overactive blood production as in posthemorrhagic anemia.

Our results indicate that the red blood cells of the donor remain in the circulation of the infant receiving transfusion for a considerable length of time. These observations are in accord with those of Ashby,[8] who showed that the red cells of the donor remained in the circulation of the recipient for a period ranging from thirty to ninety days. In one of our patients a marked plethora was induced by repeated transfusions. In this infant weighing 2.9 Kg., the corpuscular volume after the third transfusion was 214 cc., 7.5 per cent of the body weight, almost twice the usual amount for infants (normal average—4.0 per cent). The plasma volume was 179 cc., 6 per cent of the body weight, which is normal for infants. This observation is of interest in relation to the observation of Bock,[9] who found that in such varied conditions as polycythemia vera and pernicious anemia, the plasma volume in relation to the body weight remains practically constant.

Corresponding to the increase in the volume of red cells, there was a rise in hemoglobin percentage (chart 1) which usually persisted during the period of observation. In order to determine whether injected hemoglobin was destroyed, the amount of urobilin excreted in the stools was estimated before and after transfusion. It is generally assumed that the amount of urobilin excreted is an index of hemoglobin destruction. In the four cases studied in this way, no increase in the urobilin output occurred following transfusion. It seems reasonable to assume, therefore, that the injected hemoglobin remains with the recipient.

8. Ashby, W.: The Determination of the Length of Life of Transfused Blood Corpuscles in Man, J. Exper. Med. **29**:267 (March) 1919.

9. Bock, A. V.: The Constancy of the Volume of the Blood Plasma, Arch. Int. Med. **27**:83 (Jan.) 1921.

The injected plasma fluid leaves the circulation of the recipient shortly after the transfusion. The plasma proteins leave together with plasma fluid (chart 2). No constant variation in the plasma protein concentration occurs following transfusion. This is in accord with the work of Starling [10] who observed the same effect after the injection of blood into normal animals.

In the two infants in whom the serum protein concentrations before transfusion were low (3.9 and 4.5 per cent, respectively) and in whom an increase might be interpreted as beneficial, there was no change dur-

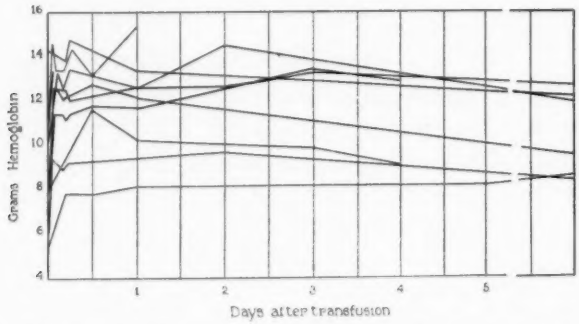

Chart 1.—The hemoglobin percentage following blood transfusion. The hemoglobin rises promptly after transfusion and persists at the high level. The determinations at the right end of the chart were made from nine to twenty-six days after the transfusion.

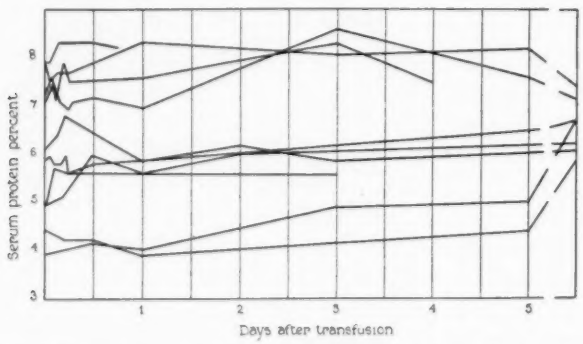

Chart 2.—The serum protein percentage following blood transfusion; no marked immediate variation. The determinations at the right end of the chart were made from nine to twenty-six days after the transfusion.

ing the first twenty-four hours, at the end of which time most of the injected plasma had left the circulation. Of the remaining four infants whose serum protein concentrations before transfusion were below 6.5 per cent, only one showed an increase (from 5.9 to 6.6 per cent).

10. Starling, E. H.: The Herter Lectures on the Fluids of the Body, V. T. Keener, 1909, p. 136.

It is interesting to note the convergence of values at the right end of chart 2. Before transfusion, while the infants were ill, there were wide variations in the protein content of the serum, and hence the points at the left hand of the figure are widely scattered from 3.9 to 7.9 per cent. As the condition of the infants improved, their serum proteins tended to approach the concentration usually found in normal infants, the high figures falling and the low ones rising.

The transmission of iso-agglutinins from donor to recipient was studied in five infants. In four there was no demonstrable iso-agglutinin in the serum before transmission. In the fifth the iso-agglutinins were present in low dilution (1:2). Three infants were in group 2 (cells agglutinated by group 3 serum and not by group 2), the remaining two were in group 3. In all five infants iso-agglutinins were demonstrated in the serum of the recipient after transfusion. In three instances the iso-agglutinins disappeared within twenty-four to seventy-two hours. In the remaining two cases the iso-agglutinins persisted in the recipient's blood for fifteen and twenty-four days, respectively, after which observations were discontinued. The transfused iso-agglutinins were always present in the recipient's serum in low dilution (never above 1:4). Although it is possible that transfusion stimulated the formation of iso-agglutinins in the infant's serum,[11] their appearance immediately after the transfusion and persistence without increase seem to indicate that they had been passively transferred from the donor.

TABLE 7.—*The Transmission of Iso-Agglutinins from Donor to Recipient Through the Transfused Blood*

		Recipient Serum-Iso-agglutinin Titer						
		Before Transfusion	After Transfusion, Days					
Case	Donor		3/24	1	2	3	6	
10. New-born; hemorrhagic disease; cells, group 2	Group 1 agglutinates group 3 cells in dilution 1:32	0	....	1:2	1:4	1:4	1:4	1:2 (15 days)
11. Six months; post-hemorrhagic anemia; cells, group 1	Group 1 agglutinates group 3 cells in dilution 1:16	0	....	1:2	1:4	0	0	...
12. New-born; hemorrhagic disease; cells, group 1	Group 1 agglutinates group 2 cells 1:32; agglutinates group 3 cells 1:16	1:2	1:4	1:4	(observations discontinued)			
13. Three weeks; malnutrition; cells, group 3	Group 3 agglutinates group 2 cells 1:64	0	1:2	1:2	...	...	0	...
14. Malnutrition; cells, group 2	Group 1 agglutinates group 3 cells actively	0	+	+	+	...	+	+ (24 days)

11. Astrowe, P. S.: Hemolysis Following Transfusion, J. A. M. A. **79**:1511 (Oct. 28) 1922.

SUMMARY AND CONCLUSIONS

The volume of plasma, volume of corpuscles, the hemoglobin percentage, serum protein percentage and iso-agglutinin titer were determined before and at repeated intervals after transfusion in infants with severe malnutrition.

The injected plasma fluid left the circulation shortly after injection.

The injected corpuscles remained in the circulation of the recipient.

Blood transfusion has little immediate effect on the serum protein concentration. Apparently the injected plasma proteins leave the circulation of the recipient with the plasma fluid.

Following transfusion there is a prompt, marked rise in the hemoglobin percentage which persists.

The urobilin excretion following transfusion is not increased, indicating that the injected hemoglobin remains with the recipient.

Following transfusion there is an increase in the iso-agglutinin titer of the recipient serum which may persist for twenty-four or more days.

LACTATE METABOLISM IN INFANTS

ITS RELATION TO LACTIC ACID MILK *

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Acid milks have been used successfully as food for healthy infants and for those with acute and chronic intestinal disturbances. The widespread use of lactic acid milk in America and of buttermilk in Europe has stimulated efforts to determine the cause of their beneficial effects. Marriott [1] believes that the effects are achieved by the neutralization of the buffer action of cow's milk. Exhaustive studies by Schiff and Mosse [2] and by Müller [3] do not substantiate such a view, although they do not offer a substitute. Moreover, Moll's [4] contention that equally good results are obtained with alkaline buttermilk, i. e., milk curdled by the addition of calcium chloride, has not been disputed. The effects of lactic acid on the absorption of inorganic salts were studied by Klotz.[5] During the last decade, many contributions on lactic acid metabolism have appeared. The possibility presents itself that the effects of lactate milk are due directly to the lactate ion. At the suggestion of Dr. György, I investigated the metabolism of the lactate ion in infants.

PROCEDURE

I determined the lactate content of the blood of healthy infants who had fasted for four hours and at intervals of one-half to three and one-half hours after they had received food containing lactic acid. The lactic acid given was twenty-five times the total amount and thirty times the concentration of lactate normally found in the blood. Determinations were then made before and after a nonacid feeding, on the same infants when possible. An interval of at least one week was allowed between

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1. Marriott, W. McKim: The Artificial Feeding of Athreptic Infants, J. A. M. A. **73**:1173 (Oct. 18) 1919.

2. Schiff, E., and Mosse, K.: Saure Milchmischungen in der Ernährungstherapie des Säuglings, Berlin, S. Karger, 1924.

3. Müller, Fritz: Ueber die Wirkung künstlich angesäuerter Milch auf Stoffwechsel des Säuglings, Ztschr. f. Kinderh. **38**:705, 1924.

4. Moll, Leopold: Ueber die Verwendung einer modificierten (alkalisierten) Buttermilch als Säuglingsnährung, Arch. f. Kinderh. **42**:327, 1905.

5. Klotz, M.: Milchsäure und Säuglingsstoffwechsel, Jahrb. f. Kinderh. **70**:1, 1909.

series on the same infant. The blood was taken from the longitudinal sinus while the infant was quiet and held in the sitting posture. Crying or muscular effort of any kind was avoided; if unavoidable, the specimen was not used.

TECHNIC

The technic used in the determinations was a modification of Clausen's [6] micromethod. The modification is described in detail elsewhere.[7] Briefly, it consists of removing the protein from 3 or 4 cc. of freshly drawn blood (Folin and Wu [8]). Sugar is removed according to Van Slyke's [6] method. Ten cc. of the clear filtrate is distilled with an equal quantity of concentrated sulphuric acid for one hour at 140 C., using an oil bath kept constantly at 150 C. The system is aerated slowly with air taken from outside the laboratory. Ground glass stoppers are used throughout, no rubber coming in contact with the reacting materials. The liberated aldehyde is passed through two sets of receivers containing 10 per cent sodium bisulphite solution. The first water cooled set, during moderate aeration, retains from 95 to 98 per cent of the total aldehyde yield. The excess bisulphite is removed with approximately a tenth normal solution of iodine, following Clausen's [6] modification of the Ripper technic. The bound aldehyde is liberated with sodium bicarbonate solution saturated with carbon dioxide, and this liberated aldehyde is titrated with hundreth normal iodine.

I shall first discuss the results obtained in six of the seven controls (who received ordinary food) which are shown in chart 1. In order to facilitate comparison of the cases, the fasting value in each was charted as 0, the actual rise or fall from this fasting value being expressed in milligrams on the ordinate. The characteristics of the curves are considered in two periods, corresponding to the early (first two hours) and the late (third hour) digestive phases. Referring to charts 1 and 2, a comparison is obtained as shown in table 1.

THE BLOOD LACTIC ACID CURVE AFTER ORDINARY FEEDING

During the first phase of digestion, when hydrochloric acid is secreted in the stomach, the acid base equilibrium of the blood is displaced toward the alkaline side. It has been shown (Brehme [9]) that during the alkalosis accompanying tetany caused by hyperventilation, the lactic acid in the blood is increased. Rona and Arnheim [10] found that in vitro in an alkaline medium, glycolysis of the blood was increased; this in turn results in an increase in the lactic acid. Macleod [11] also found an increase in the blood lactic acid after an injection of alkali into the portal vein.

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6. Clausen, S. W.: A Method for the Determination of Small Amounts of Lactic Acid **52**:263 (May) 1922.

7. Brehme, T., and Brahdy, M. B.: Zur frage der Milchsäurebestimmung, Biochem. Ztschr. **175**:348 (Aug.) 1926.

8. Folin, O., and Wu, H.: A System of Blood Analysis, J. Biol. Chem. **38**:81 (May) 1919.

9. Personal communication to the author.

10. Rona, P., and Arnheim: Biochem. Ztschr. **48**:35, 1913

11. Macleod, J. J. R., and Hoover, D. H.: Studies in Experimental Glycosuria, Am. J. Physiol. **42**:460 (Feb.) 1917.

The alkaline tide (from one-half to two hours after feeding, varying with the individual infant) is the reason for the initial rise of the lactic acid of the blood of these controls.

With the beginning of intestinal digestion, alkaline secretion into the tract takes place and the acid chyme becomes alkaline. Acid salts (phosphates) and amino-acids are absorbed from the intestine. The blood bases are diminished, acid substances are absorbed and the predigestive acid-base equilibrium returns. The disappearance of the existing alkalinity (alkaline tide) during intestinal digestion (third hour) is accompanied by a return of the blood lactate to normal.

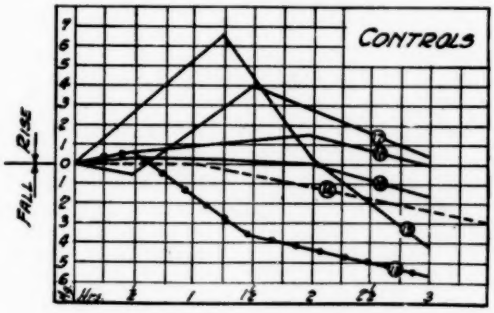

Chart 1.—Absolute variation in blood lactate in milligrams after ordinary feeding.

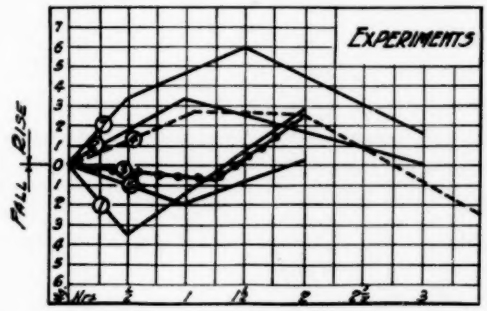

Chart 2.—Absolute variation in blood lactate in milligrams after lactic acid feeding.

BLOOD LACTATE VALUES AFTER LACTIC ACID FEEDINGS

Seven series of determinations were made; two over a period of two hours and five over a period of three hours. Five feedings were bacterially acidified, and two were prepared by the addition of 1 cc. of lactic acid.[12] By comparing the curves in chart 2 with the controls in

12. Brahdy, M. B.: A Simple Method of Preparing Lactic Acid Milk, M. J. & Rec. (ped. supp.) **120**:192 (Dec. 17) 1924.

chart 1 and by referring to table 1, it may be seen that in all the enumerated points except the last the results practically duplicate each other. In none was the concentration of lactate in the blood after lactic acid feeding higher than that found in the controls. At three hours the values in the controls were lower than those who had received lactic acid feedings, and in the majority of cases were lower than the fasting value. I have no explanation to offer for this fall. The conclusion is that the feeding of lactic acid milk does not cause a greater concentration of lactate ion in the blood than does ordinary feeding.

TABLE 1.—*Results of Feeding Experiments*

Controls	*Experiments*
A	A
During the first 2 hours	During the first 2 hours
1. There may be a rise above the fasting value (table 2, cases 13, 16 and 17). Maximum rise, 6.6 mg. Average, 2.6 mg.	1. There may be a rise above the fasting value (table 3, cases 1, 2, 3, 5 and 7). Maximum rise, 5.9 mg. Average, 3.5 mg.
2. There may be a fall below the fasting value (table 2, cases 14 and 18). Maximum fall, 4.2 mg. Average, 2.6 mg.	2. There may be a fall below the fasting value (table 3, cases 1, 3 and 5). Maximum fall, 3.4 mg. Average, 2.0 mg.
3. The greatest concentration is always found between one-half and two hours after feeding.	3. The greatest concentration is always found between one-half and two hours after feeding.
B	B
During the third hour	During the third hour
4. The values always decrease.	4. The values always decrease.
5. The lowest values are always obtained three hours after feeding.	5. The lowest values are always obtained three hours after feeding.
6. The values at three hours are the same as the fasting values (table 2, cases 16 and 17) or below this (cases 13, 14, 15 and 18). Maxium drop below fasting value, 5.6 mg. Average, 3.8 mg.	6. The values at three hours are within 1.7 mg. of the fasting value.

There is a possibility that an equilibrium exists between the lactate of the body tissues and of the blood, by which any excess in the blood is immediately removed. The work of Jansen and Jost [13] shows that such an absorption does take place, but is of short duration and is soon

13. Jansen, S., and Jost, H.: Ueber den Wiederaufbau des Kohlenhydrates in Warmblüttermuskel. Ztschr. f. physiol. Chem. **148**:41, 1925.

followed by a reverse reaction. György's [14] results, which show a rise in the lactate content of the blood in dogs with Eck fistulas, indicate that such an absorption has little or no effect. Moreover, there is a marked rise in the lactate content of the blood following venous stasis, crying or slight muscular effort.

The results in experiment 6 were entirely different from the others. To my surprise, a week later control 19 practically duplicated the curve obtained in the experiment (chart 3). The infant was well and weighed 7 Kg. at the age of 5 months, as did several of the other infants. I cannot explain the peculiarity of the curve. It is obvious, however, that the feeding of lactic acid had no effect on the lactate value of the blood other than the effects following an ordinary feeding.

RELATION OF THE LIVER TO LACTATE METABOLISM

It has been shown that there is no change in the lactate content of the blood after lactic feeding other than that which occurs after an

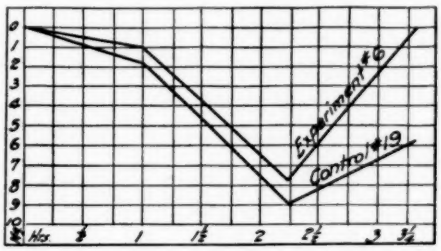

Chart 3.—Results in experiment 6 and control 19.

ordinary feeding. The action of the lactate ion cannot, therefore, be on the general body tissues. It is possible that there is an effect on the intestinal mucosa or on the liver. There has been so little work on the direct effect on the intestinal mucosa that this question must remain unanswered.

Following the extirpation of the liver in geese, Minkowski [15] found a marked rise in the urinary lactic acid. Recently, György [14] has been able to show that there is a definite rise in the lactic acid of the blood in dogs with Eck fistulas. The important rôle of the liver in the resynthesis of carbohydrate from lactic acid has been shown more directly by perfusion of the liver (Parnas and Baer,[16] Embden, Schmitz

14. György, P.: Unpublished results, Heidelberg Kinderklinik, 1926.

15. Minkowski, O.: Ueber den Einfluss der Leberextirpation auf den Stoffwechsel, Arch. f. exper. Path. u. Pharmakol. **21**:41, 1886.

16. Parnas and Baer: Biochem. Ztschr. **41**:386, 1912.

TABLE 2.—*Controls*

Control	Age, Weight, Diagnosis	Feeding	Time	Total Blood Lactate in Mg.	Difference from Fasting Value in Mg.
13	6 months 6 Kg. Fracture	150 cc., ⅔ milk	Fasting 1¼ hours 2 hours 3 hours	12.9 19.5 13.1 8.7	 6.6 0.2 —4.2
14	5 months 6 Kg. Well	150 cc., ⅔ milk	Fasting 1 hour 2 hours 3½ hours	13.9 13.9 12.9 10.9	 0 —1.0 —3.0
15	8 months 6 Kg. Rickets, tetany	180 cc., ⅔ milk	Fasting ½ hour 2 hours 3 hours	11.5 11.8 11.5 9.9	 0.3 0 —1.6
16	5 months 7 Kg. Well	180 cc., ⅔ milk	Fasting ½ hour 2 hours 3 hours	9.1 9.6 10.7 9.1	 0.5 1.6 0
17	9 months 8 Kg. Eczema	180 cc., ⅔ milk	Fasting ½ hour 1½ hours 3 hours	10.5 10.1 14.5 10.9	 —0.4 4.0 0.4
18	9 months 6 Kg. Eczema	180 cc., ⅔ milk	Fasting ½ hour 1½ hours 3 hours	15.0 15.5 11.5 9.4	 0.5 —3.5 —5.6
19	5 months 7 Kg. Well	180 cc., ⅔ milk	Fasting 1 hour 2¼ hours 3¼ hours	18.1 16.2 9.1 12.3	 —1.9 —9.0 —5.8

TABLE 3.—*Cases*

Experiment	Age, Weight, Diagnosis	Feeding	Time	Total Blood Lactate in Mg.	Difference from Fasting Value in Mg.
1	6 months 5½ Kg. Almost healed tetany rickets	Dried buttermilk	Fasting ½ hour 2 hours	17.6 14.2 20.5	 —3.4 2.9
2	5 months 7 Kg. Well	150 cc. buttermilk	Fasting 1 hour 3 hours	8.8 12.1 8.7	 3.3 —0.1
3	6 months 6 Kg. Fractured humerus	150 cc. buttermilk	Fasting 1¼ hours 2 hours 3 hours	8.2 7.5 10.7 8.4	 —0.7 2.5 0.2
4	5 months 6 Kg. Well	150 cc. buttermilk	Fasting 1 hour 2 hours 3¼ hours	10.5 13.2 13.1 9.0	 2.7 2.6 —1.5
5	18 months 8 Kg. Chronic dyspepsia	160 cc. buttermilk	Fasting 1 hour 2 hours	12.0 10.2 12.3	 —1.8 0.3
6	5 months 7 Kg. Well	180 cc., ⅔ milk, 1 cc. lactic acid added to gruel	Fasting 1 hour 2¼ hours 3¼ hours	15.8 14.8 7.9 15.9	 —1.0 —7.9 0.1
7	5 months 5½ Kg. Well	180 cc., ⅔ milk, 1 cc. lactic acid	Fasting ½ hour 1½ hours 3 hours	8.7 12.1 14.6 10.4	 3.4 5.9 1.7

and Wittenberg,[17] Baldes and Silberstein [18]). Various forms of injury of the liver diminish this power of the liver to resynthesize sugar (Noorden and Embden [19]). Isaac [20] found such a decrease after phosphorus poisoning, while Schumacher [21] demonstrated an increase in the blood lactic acid after various forms of liver disease.

The participation of the muscle in lactic acid metabolism has been demonstrated by many investigators. However, Jansen and Jost [13] have shown that in general body metabolism the rôle of the liver greatly overbalances that of the muscle.

SUMMARY AND CONCLUSIONS

1. The possibility of explaining the beneficial effects of lactate milks by the action of the lactate ion is presented (György).

2. Observations on the lactate of the blood in infants following the feeding of lactic acid milks are compared with control infants following ordinary feedings.

3. There is no marked variation between the two series, leading to the conclusion that the lactate ion does not in any way directly influence the peripheral metabolism.

4. The important rôle of the liver is emphasized, and it is suggested that the lactate ion may act on the complex metabolism in this organ.

55 Central Park West.

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PROGRESS IN PEDIATRICS

TUBERCULOSIS IN CHILDHOOD

ITS FREQUENCY, SOURCES AND DEVELOPMENT, AND HOW TO COMBAT IT, AS SHOWN BY EXPERIMENTS IN NORWAY*

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No disease is so serious as tuberculosis, whether with respect to morbidity or mortality. Consequently, it has been studied more intensely anatomically, clinically and experimentally than any other disease. Physicians have advanced some distance in the investigation of the disease; they know its cause, its most important anatomic forms and its manifold clinical appearances. They are aware of its curability—in all stages, all ages and all localizations; they know that even a tuberculous meningitis now can be cured. They also have had their eyes opened to the chronicity of the tuberculous infection and of the tuberculous diseases. A pulmonary tuberculosis can last not only through years but also through decades and indeed through the whole of a long life.

Many questions concerning tuberculosis still remain obscure; for example, the importance of a slight infection that has been overcome. Does it leave behind it immunity or an increased power of resistance and, if so, in what manner? Is it the infection in childhood that persists into adult age and forms the basis for the tuberculous lesions in the years of youth, or must a new infection be added? Is it the infection with tubercle bacilli that is the most important and decisive factor, or is it the individual's weakened power of resistance? In this respect, is there any great difference between children and adults?

These are some of the fundamental questions that are still unanswered or obscure, and they are not only of importance in regard to the treatment of the individual patient but are also of fundamental significance for the whole of the prophylactic work.

For about twenty-five years, I have studied the different phases of tuberculosis, especially the tuberculosis in childhood. In this paper, I

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shall deal with the tuberculous infection in childhood and in youth, my observations being based chiefly on my own investigations and Norwegian experiences.

Every one knows that infection with tubercle bacilli occurs frequently in all civilized communities. This fact can be established partly by anatomic examinations and partly by the tuberculin test.

Some years ago I carried out systematic investigations on this subject. In 484 postmortem examinations on children under the age of 5, I made the most careful search possible for traces of tuberculous inflammation and in conjunction therewith made microscopic examinations of the organs, especially of the lymph glands. I also inoculated cultures of the organs into guinea-pigs. The result was that 59 per cent of the children were found to have been free from tuberculous infection, while 41 per cent had been infected with the tubercle bacillus, but of these only 24.2 per cent had died of tuberculosis. In 10.7 per cent there had been a latent tuberculous lesion, and I found, after inoculation of the culture into guinea-pigs that 5.6 per cent had died from a latent infection with tubercle bacilli.

This last mentioned latent infection with tubercle bacilli—that is, the one seen macroscopically, without anatomic changes—was found especially in the lymph glands in the chest or the neck. In regard to the frequency with which the tuberculous infection occurred, 20 per cent of all the children examined were found to have been infected in the first year of life; 27.5 per cent in the second and third years, 44 per cent in the fourth and fifth years, and 75 per cent from the sixth to the fifteenth year (in the fourteenth and fifteenth years alone, 85 per cent). Thus a steady increase occurred with the years of life.

I found a congenital tuberculous infection with certainty in only one case—disseminated tubercles in both lungs in a child, aged 3 weeks, who died on the same day that its mother died of consumption (the child had been removed from the consumptive mother). Otherwise—except for two less certain cases—numerous examinations of children born of consumptive mothers and dying shortly after birth always have given a negative result.

REPORT OF CASES

Case 1 (from Fredrikstad).—On March 6, 1921, a mother was reported, who had consumption; the father was addicted to drink. They lived in a small, dark, unhealthy, dirty house. The mother would not leave home, observed no precautions and expectorated on the floor and in papers. In November, 1921, a son, aged 14, was admitted to the hospital with an attack of pleurisy. In December, 1921, the mother became ill; on December 16, she gave birth to a child, who was sent to an infant's home when 3 days old, but died of tuberculous meningitis when about 4 months old. Thus three days were sufficient for a fatal infection to take place. The mother died of consumption on Feb. 7, 1922. The two youngest children, aged 8 and 6 years, had tuberculosis of

the lymph glands of the neck. They were placed in a good home and have recovered. A girl, aged 6 years, who had been in close contact with the consumptives, died in May, 1922, of tuberculous meningitis.

CASE 2 (from Oslo).—The wife of an employee in a gas works was reported in 1913, at the age of 36, as suffering from pulmonary tuberculosis, and died, June 7, 1916.

1. A daughter, aged 12, was reported in 1916, as suffering from pulmonary tuberculosis.

2. A son, aged 14, was reported in 1920, as suffering from pulmonary tuberculosis.

3. A daughter, aged 15, had always seemed healthy, but during her school years had been troubled with enlarged glands in the neck.

4. A son, aged 12, had tuberculosis of the lymph glands in the chest.

5. A son, aged 8, was pale and thin, with enlarged glands in the neck. The family lived in a flat containing one room and kitchen, facing south. In 1922 a room facing north was added. In the latter part of the mother's life, the housekeeping and financial position were bad. The situation since had improved.

CASE 3 (from Oslo).—A painter, aged 42, was healthy but was addicted to drink. A brother had had pleurisy twice; otherwise his relatives were said to be healthy. His wife, aged 38, was reported in 1918, as suffering from consumption. She died on March 9, 1921. Her parents and two sisters were said to have died of pulmonary tuberculosis.

Of the six children, five have been reported as suffering from tuberculosis.

1. A son, aged 10, died in 1917 of abdominal tuberculosis.

2. A son, aged 6, had suffered from spondylitis since 1919.

3. A daughter, aged 9, was reported as having had consumption since she was 7 years old.

4. A daughter, aged 8, was reported in 1912 as suffering from pulmonary tuberculosis, died the same year.

5. A daughter, aged 7, was reported June 29, 1922, as suffering from pulmonary tuberculosis.

6. Only one of the children, a son, aged 15, seemed healthy.

They lived in a flat containing one room and kitchen, the living-room facing north and the kitchen facing south, otherwise in an open location.

CASE 4.—In a physician's family the nursemaid was found to have pulmonary tuberculosis and was sent to a sanatorium. A daughter of the family, aged 3½ years, who had shared a room with her, became ill nine weeks later (with fever, loss of weight and bad appetite and a strong tuberculin reaction). Another sister, aged 1½ years, who had not shared the room with the nursemaid) became ill (for a short time) thirteen weeks later. Both children were sent to the country and soon completely recovered.

CASE 5.—In another family, in which the nursemaid likewise proved to have pulmonary tuberculosis, a child of 11 months, whom she had attended for about seven months, directly from its birth, became ill with fever, inflammation in the eyes, loss of weight and tuberculosis nodules in the skin over the body. This child also recovered under proper treatment.

CASE 6.—A shoemaker frequently came to work in the farmhouses. He had been in failing health for some time and began to spit blood while working as haymaker on a farm and died of consumption in August, 1904, at the same place. He had been promiscuous with his expectorations. In 1904, his apprentice, who had gone with him to the farms and who sometimes shared a bed with him, became ill with pulmonary consumption and died of it in August,

1905. His sister contracted a tuberculous apical catarrh in December, 1904, and later on, in 1906, tuberculous peritonitis. A son of the farmer, aged 14, was affected with pulmonary tuberculosis in February, 1905, and afterwards tuberculous inflammation in the spinal column, of which he died. Two young children, who had played on the farm visited by the shoemaker, died of tuberculous meningitis in May, 1906. A younger sister of these two contracted a doubtful pulmonary tuberculosis; she was ill for some time, but recovered. Their father also got tuberculosis of the lungs, but afterward got well again. A dressmaker who often visited the house where the apprentice lay ill, also had tuberculosis.

No other source of infection could be detected for the seven or eight cases except the shoemaker and those who had become ill where he had been visiting.

SOURCES OF INFECTION

The results shown in the accompanying table, correspond closely to the tuberculin investigations, which also show a rapid rise from about 10 to 20 per cent in the first two years of life to about 50 per cent in the seventh year and 70, 80 or 90 per cent in the fifteenth year. It must be noted that this applies to children living in the larger towns,

Tuberculin Reactions in French Children (Marfan, 1923)

	Percentage Positive		Percentage Positive
In the 1st year of life	10.5	In the 9th year	73.0
In the 2d year	24.3	In the 10th year	72.0
In the 3d year	32.8	In the 11th year	71.0
In the 4th year	45.3	In the 12th year	82.7
In the 5th year	49.0	In the 13th year	87.7
In the 6th year	53.6	In the 14th year	83.8
In the 7th year	58.0	In the 15th year	79.7
In the 8th year	62.0		

in which tuberculosis is prevalent. In the rural population is found, according to Norwegian statistics, hardly more than 20 or 30 per cent infected in all and only about 50 per cent in the later years of childhood. The most infections always were found among children from homes in which there was a consumptive adult.

The path of entrance for the infection is regularly through the respiratory organs and the lungs, and it undoubtedly takes place by inhalation, whether of tubercle bacilli in dry dust or in cough droplets. Both modes of infection are important. According to my experience in Norway, the source of infection in the great majority of cases is diseased persons; that is, infection with tubercle bacilli of the human type. As a rule it is not difficult to find the source of infection in children, and the younger the child is the easier it is to find the infection. In most cases a sick mother or father is the source.

Cases 1, 2 and 3 are examples from real life of families infected by the mother, cases 4 and 5, infection by a nursemaid and case 6, infection by an itinerant workman.

A consumptive teacher also may infect the schoolchildren. Road-menders, workmen on railways, etc., may spread infection in the places in which they live. In Norway there have been several cases in which emigrants, for example to America, come home with consumption and infect their families, or indeed a whole village.

Old people with a chronic disease of the lungs of tuberculous nature but not recognized as such—so-called chronic bronchitis, emphysema,

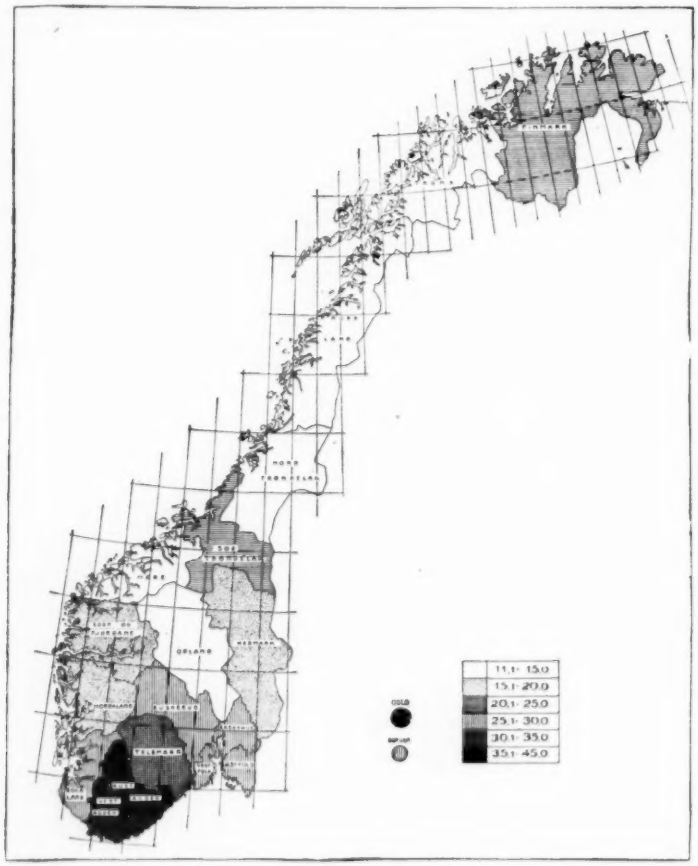

Fig. 1.—Average yearly number of deaths from pulmonary tuberculosis per 10,000 inhabitants during the five year period 1866 to 1870.

etc., are the most dangerous. With these chronic benign forms they may live a long life, go to their work without knowing that they are suffering from tuberculosis and so spread the virus around, causing death after death, especially among children and young persons.

Case 7.—Some time ago I made a postmortem examination of a man, aged 67, who had been killed by his son, and found that he had suffered from a chronic

tuberculosis of the lungs with large cavities in both lungs. He had been a busy workman and had never been ill or consulted a physician. He had never missed his work through illness—he was a lumber floater and also had a little farm. It was stated that in the last years he had been troubled with chronic bronchitis, but he had never been treated for it or been reported as having tuberculosis of the lungs. By hard work and thrift he had saved some thousand Norwegian kroner.

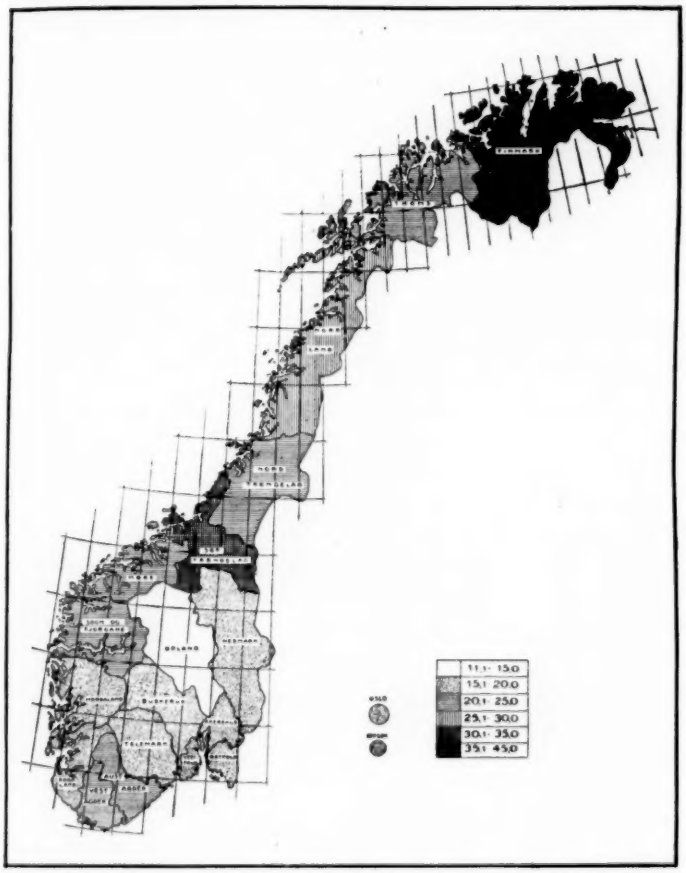

Fig. 2.—Average yearly number of deaths from pulmonary tuberculosis per 10,000 inhabitants during the five year period 1912 to 1916.

Twenty-two years previously, two of his daughters, aged 20 and 22, respectively, had died of tuberculosis of the lungs; thirteen years previously his wife also had died of consumption, and at the same time a son, aged 9, had died of tuberculosis. Four years previously, a son, aged 26, had died of tuberculosis of the lungs. Only an adult son was still alive.

The man must have suffered from tuberculosis of the lungs for several decades. He had lived with his disease and worked without knowing what he was suffering from and without taking any necessary precautions. It is

probable that he had infected his wife and his four dead children. In this case the misfortune could have been avoided if the whole family had been examined when the first case of tuberculosis occurred twenty-two years previously.

Infection from tuberculous cattle plays a small rôle in Norway, in contrast with other countries, such as Great Britain, but in accordance with, for instance, the United States. It has been found that, in about 8 or 10 per cent of all cases of tuberculosis in children, the infection is due to tubercle bacilli of the bovine type. In adults, bacilli of the bovine type are seldom found.

That bovine tuberculosis is of little significance for man in Norway also appears from another fact.

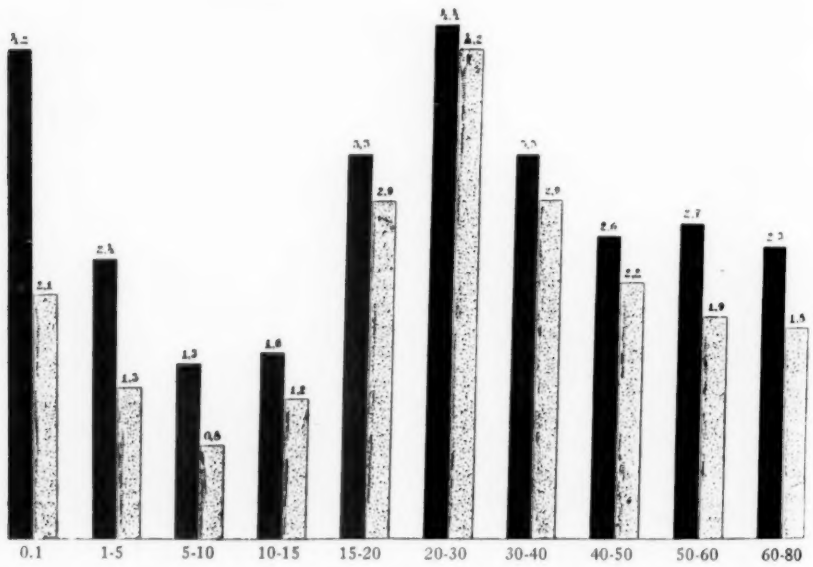

Fig. 3.—The decrease in mortality from tuberculosis in Norway per 1,000 living persons within the different ages from 1900 (black area) to 1916 (light area).

The percentage of reacting animals varies extremely in the different parts of the country. The highest percentage of reactions is found in the most pronounced agricultural and cattle raising districts in the east of Norway. In these districts the death rate from human tuberculosis is lowest. In the northern districts, in which the mortality from human tuberculosis is greatest, tuberculosis in cattle is comparatively rare. In regard to the whole kingdom, there seems to exist a sort of antithesis between the frequency of tuberculosis in cattle and in man. The same experience is reported from Sweden.

DEVELOPMENT

Tuberculous infection is thus shown to be general among children, but what happens afterward to all these infected children? What is known of their subsequent fate?

1. A number of children infected as infants die within the age of 1 or 2 years of progressive tuberculosis (especially in the lymph glands, with meningitis and miliary tuberculosis, but also consumption), although many survive the infection, more even than was formerly believed, even in this period of life, as I will show later.

2. The great majority of infected children—about 50, 60 or 70 per cent infected in the first years, though often not as infants—recover from the infection and become healthy spontaneously and are immune to a certain degree or with increased resistance.

3. Some of the rest (in all a far smaller group, about 10 or 20 per cent of the whole number, but the most important) sometimes have real tuberculosis, chronic conditions year after year, especially in the lymph glands (scrofula), and must be treated in the seaside hospitals. About one half of these die later on (from five to ten years later in the period of youth) of pulmonary consumption, tuberculosis in the bones, joints, etc., while about one half of them are cured and grow up into healthy persons.

Most of the children in this group have a latent tuberculous infection and are to be considered as "threatened with tuberculosis"; that is, they have no real tuberculous disease, but are pale and anemic and remain thin even if they receive good and sufficient nourishment; they catch cold easily and have long continued, suspicious attacks of bronchitis; they easily become tired and have difficulty in doing their school work. They may have slightly swollen lymph glands on the neck or chest, but no pronounced tuberculous localizations. If these children are exposed to continued infection or if they are living in bad hygienic conditions, many of them will contract various secondary forms of tuberculosis and will succumb to it, usually in the years of youth. From this group perhaps comes the majority of the deaths from consumption in youthful years.

An important point is that for both children and adults the decisive factors for the development of a tuberculous disease are (1) infection with tubercle bacilli and (2) a reduced power of resistance and a disposition to tuberculosis. The latter factor is all the more important the older the child, but it has also great influence as early as the first years.

Such disposition might be supposed to be congenital; for example, to be present in children born of a tuberculous mother. However, such a "tuberculous hereditary taint," as it is often called, causing one death after another from tuberculosis in a family, undoubtedly is due to the increased danger of infection and bad hygiene and not to any particular

specific disposition to tuberculous diseases. Without denying the existence of such a congenital tendency in delicate families with a disposition to disease in various directions, it is my opinion that children born of tuberculous parents are just as strong and well developed and as free from disposition to tuberculosis as other children, and if they are protected from the danger of infection from a tuberculous mother or father, or if they are removed from them, they will grow up into healthy and vigorous persons.

It is the acquired disposition that is of significance, the bad hygenic conditions, especially in the years of childhood, and which together with the latent infection form the basis for the outbreak of most cases of tuberculosis in later childhood, in puberty, and doubtless, also often in youth.

The most important factors in the disposition toward the disease, which are well known, are the fundamental points in general hygiene.

The most important provocative causes in this respect are transition to adult age with altered physiologic conditions, puberty—a period which in girls usually comes on more suddenly, rapidly and earlier (in the eleventh and thirteenth years), and in boys more slowly and steadily and somewhat later (after the thirteenth or fourteenth years). This period, which is characterized by rapid growth and increased physiologic demands in general, also involves an increased disposition for morbid conditions and especially for outbreaks of tuberculosis.

Other causes that may be emphasized are too little rest and, especially, too little sleep, an important point, particularly for school children, and one that is much sinned against.

Next come overwork and insufficient leisure and open-air life, with lack of sunlight and air.

Another provocative cause is the sudden transition to intense mental work—altered conditions of life on the whole. Of some importance are insufficient or unsuitable food and unsuitable clothing and want of cleanliness. In the later years of childhood and especially in young men and women, there is added to all this the transition to one-sided exhausting work, whether mental or in factories and industries—undoubtedly an important cause of the occurrence of many an outbreak of tuberculosis in youthful years.

The question, scientifically of exceedingly great moment and also important from a practical point of view, has now been reached; namely, whether tuberculosis in youth is the result of an infection in childhood and is "endogenous," i. e., a recurrence of that infection, or whether the tuberculosis in youthful years is due to a new infection and is "exogenous."

It is extremely difficult to clear up this much disputed question, the correct answer of which is so important for the whole of the prophylactic work against tuberculosis.

POSTMORTEM OBSERVATIONS

From a purely anatomic standpoint, I have tried to come nearer to a solution of the problem.

The postmortem material for the ten years from 1916 to 1925 has been examined. Each case was studied with the object of trying to decide from the anatomic observations and from the anamnesis whether it was a tuberculous infection from childhood that had been revived or whether a new infection existed in adult age. These are difficult decisions, often a matter of judgment, and are all the more difficult the farther one gets from the years of puberty.

Autopsies on 1,882 adults showed 239 of the deaths to be due to tuberculosis (12.7 per cent), 141 to pulmonary tuberculosis and ninety-eight to other forms of tuberculosis.

Among the 141 cases of pulmonary tuberculosis, thirty-five (25 per cent) were certainly or probably secondary infections.

Among the ninety-eight other forms (in the lymph-glands, bones and joints), sixty-five (two-thirds) were certainly or probably secondary infections.

Altogether, there were 100 secondary infections (42 per cent, or fully two-fifths).

If the years from 16 to 30 are taken, in which experience in Norway (as well as in Sweden and Denmark) shows that the mortality decreases little or not at all, the figures will be different.

Altogether, 478 died between the ages of 16 and 30, whereas 143 died of tuberculosis (about 30 per cent). Of these 143, seventy-three died of pulmonary tuberculosis, thirty-seven of the patients having secondary infections (50 per cent). Seventy died of other forms of tuberculosis, forty-two of whom had secondary infections (60 per cent). Altogether there were seventy-nine (55 per cent) of secondary (probable or certain) infections. Of course most of the deaths (thirty-four of thirty-eight) occurred between the ages of 16 and 20. Many also occurred between the ages of 21 and 25 (twenty-seven of fifty-one, more than 50 per cent) and between the ages of 26 and 30 (eighteen of fifty-four, or 33 per cent).

Thus, fully one half of the deaths from 16 to 30 years would seem to be due to an organic tuberculosis—in the lungs or other organs, meningitis, miliary tuberculosis, tuberculosis in the bones and joints, in the genital or urinary organs and in the lymph glands—which presumably is to be conceived of as a tuberculous infection continued from childhood.

These were the immediate results, numerically compared, and the conclusion to be drawn would seem to be that tuberculosis in youth is (perhaps in most cases, because the 55 per cent are to be considered as a minimum) due partly to an infection in childhood followed by a

tuberculous inflammation which persists into adult age. There are some instances in which, anatomically, there are not any grounds for assuming the persistence of an old infection, but in which the whole of the postmortem observations indicate that the infection and the resultant fatal illness first began in adult age, i. e., after the patient had reached 15 (with or without traces of old local tuberculous inflammations that had healed).

CLINICAL OBSERVATIONS

From a clinical point of view, a series of investigations of especial interest were carried out by Dr. Frölich, the professor of pediatrics in the University of Oslo, in 1912. He tested 2,900 school children, aged 7 years, in Oslo, with tuberculin, and found positive reactions in from 83 to 84 per cent; only 104 children (4.3 per cent) presented actual symptoms of a tuberculous disease in the skin, eyes, lymph glands, bones and joints. About 24 per cent were thin and appeared sickly; in 45 per cent he found swollen lymph glands in the neck.

In 1925, 2,200 of these children were reexamined at the age of 20. It was found that many deaths from tuberculosis had occurred among the girls in the later years of childhood or after puberty, both among those who had presented signs of scrofula and those who had given only a positive Pirquet reaction. Dr. Frölich thinks that the severe renewed infection (superinfection) in childhood is an important factor, as well as subsequently the strong physiologic demands in the years of puberty, together with bad hygienic conditions. On the other hand, he attaches far less importance to new exogenous infection in adult age.

These investigations, both anatomic and clinical, seem to point to the fact that it is mainly the tuberculous infection in childhood that forms the basis for the tuberculosis in youth, but also that this infection is not enough in itself; there must be added also another factor—bad hygienic conditions in general—in order that the infection really may develop into a tuberculous disease. These disposing factors have been slightly touched on before.

How shall one now—starting from the results here set forth—combat tuberculosis in childhood? One should work in two directions: (1) to reduce the possibilities of infection and (2) to endeavor to strengthen the constitution, especially in the critical time and in those children who especially need it.

The first requirement will be satisfied if one tries to have as many as possible of the tuberculous patients (with manifest tuberculosis, especially, of course, in the lungs) carrying infection removed to sanatoriums or to tuberculosis homes. This has been done in Norway for about twenty-five years, by building throughout the country large sanatoriums and smaller tuberculosis homes (about 100 in all), with an average of twenty beds, for patients with pulmonary consumption.

Fig. 4.—In this map, the circles indicate tuberculosis homes; the squares, sanitoriums, and the triangles, seaside hospitals.

When tuberculosis in childhood has decreased by about 40 or 50 per cent, especially in the first year of life, the reason, to a great extent, is to be found in these measures.

However, the older children, the so-called "children threatened with tuberculosis" who are carrying a latent infection and who are considerably affected thereby without as yet having any actual tuberculous disease must be provided for. The important thing is to strengthen their constitution and bring them through the critical period; open-air schools or permanent colonies must be established, in which the children can lead a healthy, invigorating life and at the same time receive instruction in a manner adapted to their strength and state of health. There are now twenty such permanent colonies or childrens' homes throughout the country, with accommodation for about 750 children.

There must be sea-side hospitals for really scrofulous children and preferably also special hospitals for the treatment of surgical tuberculosis in childhood.

Finally, provision must be made for removing infants and new-born babies, whose mother or parents have pulmonary consumption, from the tuberculous surroundings, preferably immediately or as soon as possible after birth. This is a new and important part of the whole tuberculosis work. This work has been taken up in Norway during the last few years. Among other things, the National Association against Tuberculosis, in 1922, erected in Oslo a special home for infants from tuberculous families, and especially for children born of consumptive mothers. In this home, which is exceedingly well equipped in every respect and under the care of Dr. Brinchmann, it is preferred to take the children immediately after birth, and they remain there only until they are 3 or 4 years old, when the most critical period is deemed to have passed. In the course of four years, ninety-five children have been admitted to this home, most of them in the first days or first weeks of life. All the children showed at birth the same degree of health and physical development as children born of healthy mothers; the average weight was 3.47 Kg. at birth. Half of the children proved to have been infected with tuberculosis in their homes before admission, but only in a slight degree. One child showed symptoms of clinically manifest tuberculosis and was transferred to a hospital. In all the others the course of the disease was latent; some of them had a little fever sometimes and were inclined to have catarrh, but recovered easily and rapidly. In these four years, only one child died of tuberculosis (tuberculosis miliaris) when 6 months old, after congenital tuberculosis had been detected in the first week of life. Since the opening of the home, forty children have been discharged, all without signs of manifest clinical tuberculosis. The children who were found not to be infected after admission also showed a negative tuberculin reaction at

the time of discharge. Most of the children discharged have been kept under observation subsequently through half-yearly visits from the physicians of the home. In five of them the general condition was bad; the condition of the others varied from satisfactory to very good. The children's progress after discharge seems in a high degree to depend on whether continued good treatment and nourishment can be assured them in their homes and how far they are protected against a new tuberculous infection.

CONCLUSIONS

There is no doubt that these measures have reduced considerably the morbidity and mortality among children and also among adults, and there is every reason to hope that this reduction can be increased from year to year. It is to be hoped that these efforts also will bear fruit in another respect. It is a fact, a regrettable fact, that no one has as yet succeeded in reducing the mortality from tuberculosis in youth, when the disease is more prevalent than in any other period of life. The reasons for this are complicated—they have already barely been touched on—and are to be found in the mode of life, occupation, social circumstances and first and foremost in the hygienic conditions under which the patients live.

One of the sources of this high rate of mortality in youth is to be found particularly among children threatened with tuberculosis. If the present efforts to save many of these children are successful, and there is good reason to believe this, they also undoubtedly will exercise an influence on tuberculosis in youth. It is to be hoped that this expectation will be fulfilled.

News and Comment

MORTALITY AMONG COLORED INFANTS

In the bulletin on infant mortality issued by the Department of Commerce and sent out, Jan. 29, 1927, the most striking thing is the fact that the mortality among colored infants in almost every city in the Union is from one and one-half to six times as great as it is among the white children under 1 year of age. The only instances in which the colored death rate is less than the white are those in which the colored population must be exceedingly small as indicated by the figures.

CLASSES FOR PREVENTION OF BLINDNESS

The National Committee for the Prevention of Blindness is sending Mrs. Winifred Hathaway, its associate director, on a long trip of instruction to visit sixteen different states. Many of these will be states in which classes for the prevention of blindness have not been held up to the present time.

APPOINTMENT OF DR. DAVISON

Dr. Wilburt C. Davison, associate professor of pediatrics and assistant dean of the medical school at the Johns Hopkins University, has been appointed dean of the new school of medicine to be established at Duke University.

CONVENTION OF INTERNATIONAL SOCIETY FOR CRIPPLED CHILDREN

The sixth annual convention of the International Society for Crippled Children was held in Cincinnati, February 16 and 17, at Hotel Sinton.

OEUVRE NATIONALE DE L'ENFANCE

L'Oeuvre Nationale de l'Enfance, 67, Avenue de la Toison d'Or, Brussels, places at the disposal of physicians, directors of social organizations, teachers, and, in general, all persons who are interested in the physical, moral and intellectual health of children, the special service that it has provided in its library.

This special library contains works treating of the protection of childhood; hygiene and school medicine; pedagogy and child psychology; the protection of mothers; working women and children; apprenticeship and vocational guidance; also considerable literature on demography, large families and charity work in general.

The library has undertaken the publication of bibliographic material on questions pertaining especially to childhood (birth rates, consultations on infant care, medical inspection of schools, abnormal children, tuberculosis, pediatrics, nurses, illegitimate children, child labor, physical education, eugenics, child psychology, and like subjects). Thirty-four such bibliographic reports have been issued to date.

The card index on bibliography, which is kept up to date, makes it possible to furnish information on all questions in the field of specialization. Extracts will be furnished to all persons who make request for such. (Translation from the French.)

EIGHTH SESSION OF THE COMMITTEE ON HYGIENE, LEAGUE OF NATIONS

The report of the Conference of Experts on the protection of infancy, which has been approved by the Committee on Hygiene, recommends an international inquiry on certain special problems relative to infantile mortality. To this end each member is requested to make observations in his own country, selecting two rural and two urban districts in which both medical and sanitary problems can be intensively studied. The combined reports on these surveys will, it is believed, be most helpful.

The conference has also expressed a desire to secure uniform methods for the registration of births and deaths; it also asks for detailed information from the various countries relative to the campaigns now under way for reduction in the death rate from diphtheria and scarlet fever.

Obituaries

OTTO HEUBNER, M.D.
1843-1926

On Oct. 17, 1926, Prof. Otto Heubner died at the age of 83 years. Born in 1843, he studied medicine under Wagner and Wunderlich in Leipzig, and was an assistant of the latter from 1866 to 1871. In 1871, he became director of the district policlinic in Leipzig, where he began his studies in pediatrics. His experiences in the policlinic formed the basis of his outstanding textbook on the diseases of children. His keen clinical sense and teaching ability marked him as the leading candidate for the chair of pediatrics at Leipzig, which was offered to him in 1891. After three years in this service he was called to the University of Berlin as the successor of Henoch at the Charité. He was active there until the age of 70, when he resigned and retired to Loschwitz, near Dresden, to spend the last thirteen years of his life.

His most important contributions to pediatric research were his investigations with Rubner on the metabolism of the infant and the determination of the caloric requirements of the infant and child, his work on infantilism and his study of pedonephritis. His early interest in infant and child hygiene and welfare did much to popularize them. It was as a teacher of pediatrics especially that he became famous. Largely as the result of his influence, full chairs of pediatrics were established in other German universities. He was an excellent pathologist and always emphasized the importance of pathologic anatomy in diagnosis. His clinics were models of clear exposition of clinical conditions. He was a physician to whom medicine was not only a science but also an art.

H. F. HELMHOLZ.

PROF. J. DE BRUIN, AMSTERDAM

On Monday, January 24, Prof. J. de Bruin died at Amsterdam at the age of 65 years. He was a professor of pediatrics at the university there. He worked in the laboratories of Stokvis in 1889, taking his doctor's degree; after that he was a general practitioner, gradually specializing in pediatrics, and in 1898 became "privaat-docent" in pediatrics at the

Amsterdam University, a year later becoming "elector." In 1917, he was made the first professor of pediatrics at the university. He was the first pediatrician of Holland and was especially known in his own country for his diagnostic ability. He wrote many treatises and together with Dr. Cornelia de Lange published a book on "Infant Feeding in the First Year of Life." In his earlier years he had only poor equipment with which to work, but after 1917 a modern clinic was built and since then he had been much better situated. He was a man of wide reading and was popular with his students, and all with whom he came in contact learned to love him and to appreciate his modesty.

S. VAN CREVELD.

Abstracts from Current Literature

Pathology, Bacteriology and Biochemistry

Determination of the Icterus Index with Capillary Blood. David Davis, Am. J. M. Sc. **172**:848 (Dec.) 1926.

A new and simple clinical method for the determination of the icterus index is presented. A few drops of blood are taken up in a 2 mm. tube, centrifugalized, and the serum compared with standards. The use of such a small amount of blood makes this test particularly suitable for study of the icterus index in infants. The author believes that, according to his experience, the test is accurate and reliable.

Parsons, Ann Arbor.

The Surface Tension of the Blood Serum in Nephritis. Louis Leiter, J. Clin. Investigation **3**:267, 1926.

Studies on the surface tension of the blood serum were made in seventeen cases of nephritis showing edema of noncardiac origin. Except in three cases of apparently pure lipoid nephrosis, the author found no parallelism between the surface tension and the edema. The edema was found, however, to be associated regularly with lowered plasma albumin content.

The Effect of Breathing Oxygen-Enriched Air During Exercise Upon Pulmonary Ventilation and Upon the Lactic Acid Content of Blood and Urine. A. W. Hewlett, G. D. Barnett and J. K. Lewis, J. Clin. Investigation **3**:317, 1926.

During strenuous exercise, the pulmonary ventilation increases out of proportion to the alveolar carbon dioxide tension. Excessive formation of lactic acid and want of oxygen are said to be contributory factors. It was found that when oxygen enriched air was breathed, there was a smaller rise in the blood lactic acid and a smaller excretion in the urine. Excess excretion of lactic acid was demonstrated only when the blood lactic acid rose to 30 or 40 mg. per hundred cubic centimeters.

Leslie, Chicago.

Immunity to Pneumococcus Produced in Rats by Feeding Tissues of Animals Killed by the Same Organism. V. Ross, J. Immunol. **12**:219, 1926.

Rats fed on the tissues of animals killed by pneumococcus type 1 show an increased resistance to intraperitoneal injections of the same germ. The protection seems to be type specific. Protective substances exist in the serums of the immunized animals. Reference is made to the favorable immunization created by the feeding of pneumococci. An explanation is suggested for the fact that those types of pneumococci most commonly found in normal mouths are the cause of a minority of actual cases of lobar pneumonia.

Immunity to Pneumococcus Produced in Rats by Feeding Them the Germ. V. Ross, J. Immunol. **12**:237, 1926.

Rats which are fed the living pneumococci from 50 cc. of culture per day are considerably more resistant to intraperitoneal injections of the same organism than are untreated control animals. The degree of protection is

as good, although not so regular, as that which was obtained when the tissues of animals killed by pneumococcus were fed. Rats which are fed the heat-killed pneumococci (80 C., two hours) in the same quantities show a decidedly inferior degree of immunity.

THE INCIDENCE OF PNEUMOCOCCUS TYPES IN THE PNEUMONIAS OF CHILDREN. RUTH E. WESTLUND, J. Infect. Dis. **38**:514, 1926.

In a series of sixty-nine cases of lobar pneumonia and thirty-four cases of bronchopneumonia occurring in children between the ages of 3 weeks and 11 years, pneumococci were obtained by nasopharyngeal swabbing in 60.8 per cent of the cases of lobar pneumonia and in 52.6 per cent of the cases of bronchopneumonia.

The relative incidence of pneumococcus types in these two groups of cases was much the same, group 4 predominating, type 2 coming next in frequency, type 1 third, and type 3 being least frequent. The fixed types of pneumococcus are less frequent in the pneumonias of children than in those of adults. The association of group 4 with representatives of one or another of the fixed types was demonstrated in several instances.

In a group of thirteen cases of nonpneumonic respiratory disease in children, pneumococci were present in 92 per cent. No examples of types 1 and 3 were encountered, type 2 and group 4 forming one third and two thirds, respectively, of isolated pneumococci.

In forty-eight nonrespiratory diseases in children, pneumococci were found in 58 per cent. Type 1 was not represented in this group, type 2 formed 14.2 per cent, type 3, 3.6 per cent and group 4, 82.1 per cent. The occurrence of type 2 pneumococci in the throats of these children in the hospital wards may have been due to contact.

AUTHOR'S SUMMARY.

THE ACTION OF THE ULTRAVIOLET LIGHT ON EXPERIMENTAL VACCINATION. P. CARNOT, L. CAMUS and H. BENHARD, Paris méd. **51**:506 (Dec. 18) 1926.

Rabbits were inoculated with vaccine in which the skin reaction time had been established by controls. Parts of the area of vaccination were covered with an aluminum shield and the whole exposed to a mercury vapor lamp to the point of erythema. There was no reaction in the skin surface exposed, while that shielded gave the characteristic one. The authors therefore conclude that irradiations of short wave length cause modifications in the skin so that a local state of immunity results. They believe that this may have a practical application in the treatment of smallpox.

SANFORD, Chicago.

RELATIONS BETWEEN THE VIRUSES OF EPIDEMIC ENCEPHALITIS, ACUTE ANTERIOR POLIOMYELITIS AND HERPES. M. GERBASI and M. GIUFFRÈ, Riv. di patol. sper. **1**:94, 1926.

Material and cultures from ten cases of labial herpes, five children with epidemic encephalitis and three children with acute anterior poliomyelitis were used in cross inoculations and tests of various kinds. The experimental encephalitis induced in rabbits by each of these three viruses seemed to be identical in all, both in symptoms and pathologic anatomy. The meningeal and encephalitic reaction to these filtrable viruses seems to be identical further with the encephalitis produced by inoculation with the virus of contagious epithelioma of fowls and of infectious encephalitis in horses, and also the spontaneous encephalitis of rabbits. Deviation of complement tests was positive for each disease and reciprocally

positive with epidemic encephalitis and acute poliomyelitis, but not with herpes. All the data presented confirm the close kinship or even identity of the viruses of the two former. The special lesions were punctate hemorrhages in the white matter of the brain and keratitis from inoculation of the cornea; there were no foci of necrosis in the white or gray matter.

E. P. CUSHING.

IRON METABOLISM IN SPLENECTOMIZED DOGS. J. IRGER, Biochem. Ztschr. **169**:417 (March) 1926.

There was no change in the iron content of the urine, feces, bile or blood following splenectomy in dogs.

THE EFFECT OF THE MINERAL CONTENT OF FOOD ON THE POWER OF THE ORGANISM TO FORM HORMONES AND GLYCOGEN. BUNJA KOBORI, Biochem. Ztschr. **173**:54 (June) 1926.

Kobori varied the mineral content of the food of rats and noted the variations in the amount of thyroxin in the thyroid, epinephrine in the suprarenals and glycogen in the liver and muscles. The thyroxin was diminished on a diet low in calcium and increased on a diet high in potassium. The epinephrine was diminished on a low potassium diet, increased on a high potassium diet, and slightly diminished on a high calcium diet. The glycogen content of the liver showed only small variations, being increased on a high calcium and decreased on a low potassium diet. There was no change in the glycogen of the muscles.

FURTHER INVESTIGATIONS ON THE RÔLE OF THE SPLEEN IN IRON METABOLISM. N. SCHEINFINKEL, Biochem. Ztschr. **176**:341 (Sept.) 1926.

Splenectomy in guinea-pigs is followed by an increase of 60 per cent in the iron content of the liver. In some cases an increase was present as early as the third day. The author emphasizes the many precautions necessary in evaluating results.

BRAHDY, New York.

COMPLEMENT FIXATION IN RABIES. L. HOROWITZ-WLASSOWA, Centralbl. f. Bakteriol. **98**:216, 1926.

The serum of rabies infected or immunized rabbits gives fixations with the rabies virus (fixed as well as street). Fixation was not obtained with the serum of persons subjected to preventive treatment against rabies. For diagnostic purposes, the cord of animals suspected to have rabies may be tested with the serum of rabbits immunized with extracts of the salivary glands of rabic dogs. When antigen from the salivary gland is to be tested, the serum of rabbits infected or immunized with fixed virus can be used. Emulsion of fresh or glycerolated fixed virus is most effective for immunizing purposes.

AUTHOR'S SUMMARY.

STUDIES OF THE ANAEROBES OF THE BOWEL OF THE INFANT. H. KLEINSCHMIDT, Jahrb. f. Kinderh. **60**:127 (Oct.) 1925.

The Anaerobes of the Soap Stool: A smear from these stools shows the presence of gram positive bacilli as well as *B. coli*, and dark field examination shows the presence of spores on some of these bacilli.

Anaerobic cultures in eight such cases showed the presence of *Bacillus putrificus tenuis* in all. The gas bacillus of Fraenkel and *Bacillus amylobacter* also were isolated. *Putrificus verrucosus* also was found in all. *Bacillus putrificus tenuis* seems to be particularly common in the soap stool. The gas bacillus of Fraenkel reduces bilirubin to urobilin; *Bacillus amylobacter* and *putrificus tenuis* in occasional strains, and always when associated with *Bacillus coli,* would reduce bilirubin.

A total destruction of the bilirubin molecule by anaerobes was not noticed.

EHRMANN, Chicago.

PHYSIOLOGIC CHANGES IN THE SERUM PROTEIN OF THE CHILD, HEINRICH SUSSMANN, Monatschr. f. Kinderh. **34**:114, 1926.

Using the method described by Leendertz, the author studied the relation of protein to globulin in the blood serum. In the young child there is no definite relationship between the two factors. In the older child and in the adult, however, there is some similarity in the curves in that both total protein and globulin increase toward evening. This increase seems to parallel the slight rise in temperature that is associated with the day's work.

The increase in globulin may be due to a number of causes. It seems to occur during the incubation of a grip as well as from an increase of exercise.

While changes in protein seem to depend on fluctuations of body water, the labile globulin content of the blood serum seems to depend more on protein metabolism itself.

STUDIES OF THE GAS METABOLISM OF CHILDHOOD AND PUBERTY. HERMAN SCHADOW, Monatschr. f. Kinderh. **34**:145, 1926.

Schadow reviews the literature and describes an apparatus. He says that the gas metabolism of childhood and puberty is in no way different from that of the adult.

GERSTLEY, Chicago.

FUNCTIONAL LIVER TESTS WITH AZORUBIN S. RUDOLF FENSTERMANN, München. med. Wchnschr. **73**:859, 1926.

The author arrives at the conclusion that azorubin S is particularly suitable for the chromodiagnosis of the liver. Normally, it is excreted chiefly in the bile. If the liver is blocked by diffuse parenchymatous disease, toxic or anatomic in nature, it appears more in the urine. Four cubic centimeters of a 1 per cent solution of azorubin S is injected intravenously. The quantitative calorimetric determination in the urine gives values parallel to the severity of the lesion in the liver, corresponding to a diminished and delayed excretion in the bile.

SWEAT IN MAN: MICROOBSERVATIONS WITH CONTRAST STAINING. O. MOOG and K. BUCHHEISTER, München. med. Wchnschr. **73**:895, 1926.

The method of Jurgensen, published in 1924, was used. Jurgensen made use of a blue dermatograph and cedar oil. The authors undertook to study the secretion of sweat under various conditions, after injections of pilocarpine atropine epinephrine, etc. The influence of mental activity on sweat excretion also was studied.

THE ORIGIN OF THE NITROGEN LOSS IN FEVER: THEORETICAL CONSIDERATIONS. W. BIRK, München. med. Wchnschr. **73**:1147, 1926.

The loss of protein in fever is not due to inanition but is referable to toxic stimulation of the cells of the (sympathetic) protein metabolism center in the brain. Because of impulses that arise in this center the liver gives up a part of its stored protein.

INVESTIGATION ON THE RELATION BETWEEN THE AMOUNT OF FREE AND COMBINED BLOOD AMINO-NITROGEN AND THE CONTENT OF THE BLOOD IN NUCLEATED CELLS: A CONTRIBUTION TO THE KNOWLEDGE OF BLOOD AMINO-NITROGEN IN DIFFERENT SPECIES OF ANIMALS. E. BECHER and E. HERMANN, München. med. Wchnschr. **73**:1230, 1926.

The blood of animals with nucleated red blood corpuscles contains more free and combined amino-acids than that of animals without. The figures correspond to those obtained in man in cases of leukemia associated with a large number of leukocytes. When the amino-acids of the blood in the presence of nucleated red cells are increased, the aromatic amino-acids take part in this increase. A certain parallelism exists between the content of the blood of various animals in uric acid and the amount of free and combined amino-acid nitrogen. The high amino-acid values are not referable to peptones.

MADDER AND RICKETS. ADOLF BAUER, München. med. Wchnschr. **73**:1276, 1926.

In experiments on rabbits it was seen that an animal which received only red rays from diffuse daylight did not show any staining of the bones, when it was fed with madder. There was no essential difference in the staining of the skeleton of animals exposed to the blue or red rays of the direct sunlight but the condition of the animals exposed to the blue light was much better than that of those exposed to the red light.

A SIMPLE METHOD FOR THE QUANTITATIVE DETERMINATION OF TOTAL PROTEIN IN SMALL AMOUNTS OF CEREBROSPINAL FLUID. (SULPHOSALICYLIC ACID TEST). M. CUSTER, München. med. Wchnschr. **73**:1324, 1926.

One-tenth of a cubic centimeter of cerebro-spinal fluid is mixed with 0.4 cc. sulphosalicylic acid in small test tubes of uniform size and the turbidity is compared with the turbidity obtained in the same manner with serum dilutions of varying protein content. These serum dilutions when properly prepared keep from eight to ten weeks.

CHANGES IN STREPTOCOCCI. R. HUBERT, München. med. Wchnschr. **73**:1695, 1926.

Hemolytic streptococci change to anhemolytic streptococci in animals given large doses of a flavine dye (rivanol). Anhemolytic streptococci obtained from the heart, blood and peritoneum showed definite instability of their anhemolytic condition and were apathogenic for mice. In the course of several subcultures, the hemolytic property was regained, and they became as virulent as before. Anhemolytic streptococci grown from the spleen remained highly virulent. These streptococci were labile if injected into an experimental animal immediately after being obtained and regain their hemolytic property.

EOSINOPHILIA AND THE SPLEEN. J. K. MAYR and C. MONRORPS, München. med. Wchnschr. **73**:1777, 1926.

The fat and connective tissue were removed from the spleens of the pigs which were finely divided by the aid of fullers' earth after the administration

of saline solution. The juices were pressed out and the protein removed by means of methyl alcohol. From this extract a powder was prepared, and 1 cc. of a 1:1,000 solution was used. After splenectomy and anaphylactic eosinophilia such injections produced a marked decrease in the eosinophils. It is always possible to produce this diminution of the eosinophils. In some skin diseases associated with hypereosinophilia, injections of this extract of the spleen brought about a diminution of the eosinophilia, and at the same time the itching was correspondingly relieved.

THE LACTIC ACID CONTENT OF PATHOLOGIC FLUIDS. R. SCHELLER, München. med. Wchnschr. **73**:1879, 1926.

Transudates of the pleura contain the same amount of lactic acid and sugar as the blood. Depending on circumstances, the lactic acid content in sterile lymphocytic and leukocytic fluids varies from 17 to 32 mg. per cent. In cases of tuberculosis of the pleura and of purulent infections, there was not any sugar present in the exudate, but relatively large amounts of lactic acid were present. The same condition was found in the tumor exudate. In ascitic fluids in cases of tumor, the lactic acid value was high but the sugar content was not essentially diminished. Transudates and exudates of the pleura, as well as ascitic fluid, show glycolysis as long as they have pus forming elements.

AMBERG, Rochester, Minn.

PROMOTION OF GROWTH OF BONE BY BONE EXTRACTS. CARLA ZAWISCH-OSSENITZ, Wien. klin. Wchnschr. **39**:1301 (Nov. 4) 1926.

This work was suggested by Robison's recent discovery that an aqueous extract of the bones of young animals, when added to a solution of hexose-mono-phosphoric acid, causes phosphate to be freed. Robison attributes this phenomenon to an enzyme (hexose-monophosphatase) whose probable seat of action is the osteoid and cartilage cells.

To confirm Robison's work in vivo, Zawisch-Ossenitz killed one of a litter of seven young rabbits and prepared an aqueous bone extract. One cubic centimeter of the extract was injected subcutaneously into three rabbits three times weekly, three others serving as controls. A treated and an untreated rabbit were killed at the end of twenty-two, twenty-nine, and fifty-seven days. The femur, tibia, and humerus were preserved in formol-alcohol for further study. The bone lengths, absolutely and in relation to body lengths, were greater in the injected than in the control animals, with only one exception. The absolute and relative bone weights of the treated rabbits generally exceeded those of the untreated ones. Calcium content determinations disclosed the bones of the injected animals to be poor in lime content in comparison with the controls. From this demonstration, that the injection of bone extracts promoted growth in the length and weight of young bones, the author concludes that the extract contained an enzyme, probably identical with that of Robison, which accelerated the new formation of organic bone. He would attribute the fact that the bones were poor in lime content to a low calcium content in the food that the animals received.

OLMSTED, Seattle.

THE ANAPHYLACTIC ANTIBODY AND ITS RELATIONS TO THE PROTEINS AND TO THE OTHER ANTIBODIES OF IMMUNE SERUM. R. DOERR and C. HALLAUER, Ztschr. f. Immunitätsforsch. u. exper. Therap. **47**:363, 1926.

The globulin fraction of immune rabbit serum was found to contain the anaphylactic and other so-called antibodies, all except the amboceptor, in less

concentration than the original in the serum. When the proteins of immune rabbit serum were separated into a euglobulin and a pseudoglobulin and albumin fraction by dialysis, antibodies were present in each fraction. The unitary hypothesis of the nature is upheld. The difference in antibody action does not depend on different bodies, but on the different indicators by which antigen-antibody reactions are recognized.

[ARCH. PATH.]

FURTHER EXPERIMENTAL RESEARCHES ON IODINE ABSORPTION IN THE THYROID GLAND. A. ECKSTEIN and MARIA NUELLE, Ztschr. f. Kinderh. **40**:488, 1925.

In experiments with dogs, it was demonstrated that the oral administration of iodine leads to a very small retention in the thyroid gland. The content of iodine is independent of the weight, and up to a certain degree, of the form of the gland, and even in respect to the halves of the gland, can be different. These experiments confirm the work with children in the previous article. The action of iodine must be catalytic.

THE IMPORTANCE OF THE TRYPANOCIDAL ACTIVITY OF THE BLOOD SERUM OF INFANTS. E. NEUMARK and H. PORGORSCHELSKY, Ztschr. f. Kinderh. **40**:535, 1925.

Human serum has the power to confer far-reaching protection against trypanosomes, and first appears in babies from 11 to 15 weeks of age, diminishes with any infection accompanied by fever, and returns with convalescence. Two hundred and twenty-five determinations were made with the serum of ninety children in 550 mice infected with *Trypanosoma brucei*. The reason for the appearance of this power and its variations is not clear.

EMERSON, Boston.

THE INFLUENCE OF DIFFERENT EXTERNAL FACTORS ON THE DEVELOPMENT OF YOUNG RATS. H. VOLLMER, Ztschr. f. Kinderh. **41**:205, 1926.

Vollmer tried the comparative effect on young rats of darkness and daylight and sunshine, daylight and sunshine after sensitization with eosin, cleanliness and dirt, narrowness and freedom of quarters and warmth and cold. The experiments with different degrees of temperature had to be abandoned because of the difficulty in keeping the temperatures constant. Lack of room and restriction of movement for seventy days, as compared with sufficient room, and dirt instead of cleanliness, work strongly to delay development. The effects of different degrees of light were less marked. The weight curves of animals kept in the dark and in the light were about the same, but after sensitization with eosin rats showed an increase in weight when exposed to daylight and to sunlight.

The blood phosphorus varied considerably, from 7.7 mg. per cent to 11.4 mg. per cent. The average value was about the same with the different groups; those exposed to daylight, to daylight after eosin, to sunlight and to sunlight after eosin, etc. There was no increase in the red cell count under the influence of sunlight; instead, the rats kept in darkness showed on the average the highest red cell count and those exposed to sunlight after the administration of eosin the lowest.

EMERSON, Boston.

ROENTGENOLOGIC AND EXPERIMENTAL STUDIES IN THE PATHOGENESIS OF DYSCHONDROPLASIA (OLLIER'S DISEASE). P. K. G. BENTZON, Acta radiol. **3**:89, 1924.

The author believes that the formation of cartilage in dyschondroplasia is due to an active hyperemia in the bone. He compares it to the formation of callus and cartilage in a fracture in which there is an abundance of blood.

The hyperemia, he believes, is due to a failure from one cause or another of the vasomotor constrictor nerve fibers that supply the nutrient vessels of the long bones. One set of experiments, in which the sympathetic cords were destroyed along the spinal column of rabbits, proved unsuccessful. Another set in which alcohol was injected about the nutrient arteries of the long bones was sufficiently successful to cause him to feel that he had partly, at least, proved his point. Lesions that corresponded in many respects to those of the disease in man were produced in the bones of rabbits.

The author notes that the disease is often confined to one half of the body. He also emphasizes the fact that the pathologic changes in the bones follow the paths similar to those of the arteries of the bones.

EXPERIMENTAL STUDIES ON THE PATHOGENESIS OF COXA PLANA (CALVE-LEGG-PERTHES-WALDENSTROM'S DISEASE) AND OTHER MANIFESTATIONS OF LOCAL DYSCHONDROPLASIA. P. K. G. BENTZON, Acta radiol. **6**:155, 1926.

The blood vessels of bones from dead bodies and amputations were injected with zinnabar-gelatin solution so that their size, location and distribution might be studied. Bentzon found the vessels of some of the more important epiphyses to enter the epiphysis by passing between the edge of the articular cartilage and the end of the diaphysis of the long bone, thus subjecting them to trauma by pressure and stretching.

The author then injected alcohol about the large vessels leading to the heads of the femurs in laboratory animals, in order to get a prolonged active hyperemia by the paralysis of the vasomotor constrictor nerves of the arteries. He later found lesions in the epiphyses of these animals similar to those in coxa plana and other local dyschondroplasias.

He concludes that these diseases in man are caused by trauma, either by pressure or stretching, of the vasomotor constrictor nerves to the epiphyseal arteries, thus causing their paralysis. The arteries are not occluded, as previously held by some authors, but become more or less permanently dilated, causing the proliferous and absorptive processes that are so characteristic.

BARNETT, Chicago.

THE PARTITION OF SUGAR BETWEEN THE PLASMA AND THE RED CORPUSCLES IN MAN. RICHARD EGE and KAREN MARIE HANSEN, Ugesk. f. Læger **40**:893, 1926.

When the blood from fasting persons was analyzed for sugar by the method of Hansen, it was found that:

$$\frac{\text{Grams of sugar in red corpuscles} \times 100}{\text{Grams of sugar in plasma}} = 100$$

A series of experiments also were carried out to show that there is a considerable amount of bound reducing substance in the red corpuscles which is not given off instantly to a surrounding media having a lower sugar concentration.

The results of the investigation corroborate Ege's idea that the partition of glucose between the plasma and the red corpuscles in man cannot be explained as a simple partition of free glucose dissolved in the water phase of the plasma and the red corpuscles.

SCHLUTZ, Minneapolis.

INVESTIGATION INTO TYPE DIVISION OF MENINGOCOCCI. MARTIN KRISTENSEN and OTTO MOLTKE, Acta path. et microbiol. Scandinav. **2**:19, 1925.

No generally applicable division of meningococci into types or groups is known. This does not mean that investigations into the mutual relationship of strains of meningococci are futile; but they ought to be made principally in direct connection with the local epidemiologic questions, the strains isolated from the patients and healthy persons being compared immediately with each other, whereas the importance of investigating their relationship to so-called standard type-serums must be regarded as being problematical. The serologic investigations should be supplemented by other available methods of investigation, especially the appearance of colonies in protracted cultivation on thick ascites agar and, perhaps, fermentation tests. Semifluid agar is an excellent medium for the maintenance of meningococcus cultures.

AUTHORS' SUMMARY.

Nutrition

GASTRIC ACIDITY IN INFANTS. LUCY WILLS and DONALD PATERSON, Arch. Dis. Childhood **1**:232, 1926.

The titratable acidity and p_H (Levy, Rountree and Marriott) were determined on gastric contents removed after the regular feeding. In ten normal infants (aged from 1 to 9 months), the average p_H was 3.02; the average on breast milk, 2.7, and on artificial feeding, 3.5. The acidity curve reached a peak in from one to one and one-quarter hours.

In sixty-three underweight children (aged from 3 weeks to 1 year), the average p_H was 3.94. Free hydrochloric acid was found in 12 per cent. The maximum average of titratable acidity was from 35 to 55 per cent.

Seven children (aged from 2 to 9 months), persistent vomiters, showed an average p_H of 2.14.

Thirty-two infants (aged from 1½ to 10 months), seriously ill with acute infections, showed an average maximum acidity ranging from p_H 3.4 to 5.14 and a range of titratable acidity from 12 to 80 per cent.

Gastric acidity in active healthy children, particularly those who have been breast fed, is such that active peptic digestion could take place. Free hydrochloric acid is frequently present at some stage of digestion. Artificial feeding causes a delay in the maximum rise, even when the buffer value of food is approximately that of breast milk. The lowering of gastric acidity that takes place in sick children, except in uncomplicated cases of vomiting, is a general process not related to one particular food.

CALCIUM ABSORPTION IN RELATION TO GASTRIC ACIDITY. LUCY WILLS, P. SANDERSON and DONALD PATERSON, Arch. Dis. Childhood **1**:245, 1926.

Two children receiving hydrochloric acid milk, one child receiving ammonium chloride and three children on a diet of lactic acid milk were studied by means of fixed diets and metabolism beds. Eight cases of rickets also were studied. Calcium retention was decreased (negative balance) in infants receiving hydro-

chloric acid milk or ammonium chloride. Lactic acid milk caused a loss of calcium. In healing rickets, calcium retention was increased. Gastric acidity does not appear to be a limiting factor in the supply of calcium to the body.

PETERMAN, Milwaukee.

A GOOD DIET AND A BAD ONE. AN EXPERIMENTAL CONTRAST. ROBERT MCCARRISON, Brit. M. J. **2**:730, 1926.

McCarrison refers to a previous paper in which he has spoken of the high degree of efficiency attained by some of the Indian races — the Sikhs and certain Himalayan tribes — whose food consists of coarsely ground whole wheat, milk, milk products, tubers, roots, green leafy vegetables and fruit, with meat occasionally. In physical development, hardihood and powers of endurance they are probably unsurpassed by any other races of mankind. The conclusion was drawn that this is due, in the main, to the high nutritive quality of whole wheat, as compared with other staple food grains (such as rice), and to the manner in which these races combine whole wheat with other protective foods — milk, milk products, fruit and green leafy vegetables. This conclusion has now been subjected to the test of experiment, and the effects on omnivorous animals of "a good diet," constituted as the one described above, have been compared with those of a "bad diet," such as is used by many western people of the poorer classes.

The conclusions are as follows: The "good diet" far surpasses in nutritive value that composed of bread, tea, sugar, margarine, jam, boiled vegetables and tinned meat, to which the common food preservatives, boric acid, formaldehyde vapor, and sulphurous acid—have been added. The former produces physical efficiency and health but the latter gives rise to stunting of growth, physical inefficiency and often to disease. The maladies for which the bad diet is so apt to lay the foundation are lung and gastro-intestinal disease. McCarrison concludes finally that the high incidence of diseases of the lungs in the ill-fed group emphasizes no less strikingly the influence of what one may call the "white-bread-margarine-tea-sugar diet" in favoring the operation of pathogenic agents that attack the lungs.

BROWN, Toronto.

PHYSIOLOGY OF THE SECRETION OF THE MAMMARY GLANDS. R. DYROFF, Arch. f. Gynäk. **129**:308 (Sept. 2) 1926.

A thermometer is pushed 5 cm. into the breast through a small incision in the skin on the lateral aspect, and the intramammary temperature is measured. In the normal nonlactating breast, the temperature is from 1.5 to 5.5 F., with an average of 2.9 F. below the rectal temperature. In the lactating breast, the intramammary temperature closely approximates the rectal temperature, averaging 2 degrees higher than the controls. The temperature depends primarily on the activity of the secretion of the mammary glands, but also on the mechanical demand on the breast and the completeness in emptying it. A temperature higher than that by rectum is indicative of actively secreting mammary glands. If the intramammary temperature is higher than the rectal temperature and there is an insufficient supply of milk, the breast is not being emptied properly. There is no rise in the mammary temperature during the act of nursing, but an increase of one-half degree was noted from ten to fifteen minutes after cessation of nursing. This increase gradually disappears during the next three or four hours. The submammary temperature used by Moll is considered inaccurate.

BRAHDY, New York.

INVESTIGATION OF GASTRIC SECRETIONS OF CHILDREN WITH INDEFINITE DISTURBANCES OF THE STOMACH. FRANZ ROHRBOCK, Jahrb. f. Kinderh. **109**:7, 1925.

The comparatively large number of children brought to the hospital outpatient department with vague complaints of anorexia, loss of weight, indefinite pain in the stomach or discomfort, general nervousness, etc., who, on examination showed no definite pathologic changes, stimulated the author to investigate the secretory function of the stomachs of these children.

An Ewald test-breakfast was given, using water in place of tea, and the stomach contents were aspirated after forty-five minutes.

In all, sixty-five cases were investigated. These were divided into four groups as follows: group 1: those patients whose chief complaint was retarded general development and lack of appetite, and in whom there were no objective symptoms aside from a moderate degree of anemia; group 2: those whose predominating disturbance, besides anorexia, was gastro-intestinal pain, vomiting, constipation and occasionally diarrhea; group 3: those in whom neuropathic symptoms were the most prominent and were accompanied by indefinite symptoms of disturbance of the gastro-intestinal tract, such as occasional vomiting, generalized abdominal pain, anorexia, fainting spells and headache; group 4: those children who, with definite tuberculosis, had lack of appetite as a chief complaint.

A tabulation of the results in each group gave the following results: In groups 1 and 2 there was a moderate degree of hypo-acidity; in group 4 there was a high degree of hypo-acidity even to anacidity, while in group 3 there was a definite hyperacidity of medium to high grade.

The author speculates over a constitutional basis for these changes in secretory function, and suggests a "gastro-enteropathic diathesis." A plea is made for more frequent functional tests of the stomach in these obscure cases with indefinite gastro-intestinal symptoms.

PARMELEE, Chicago.

THE TREATMENT OF ACUTE DIARRHEAL DISTURBANCES OF NUTRITION IN THE FIRST YEAR OF LIFE. H. BUSCHMAN, Ztschr. f. Kinderh. **40**:590, 1925.

In diarrheal disturbances in infants, 10 per cent rice water, which is a very poor medium for *B. coli*, used by itself and then alternately with concentrated albumin milk, works very well. In cases of dystrophy and of atrophy when an increase in calories by means of concentrated mixtures, or an increase of vitamins, or both, yielded no result in the way of a gain in weight, parenteral use of lipoid was successful. Fat injected intramuscularly gives the body an impulse to utilize fat in the food at times when this power seems lost. Once babies are doing well on ordinary milk mixtures, beet sugar is used instead of cane sugar because of its salt content, its small tendency to ferment, and its taste.

PATHOLOGIC METABOLISM OF PYLOROSPASM. H. VOLLMER and J. SEREBRIJSKI, Ztschr. f. Kinderh. **41**:209, 1926.

According to the present theory of its origin, spasmophilia should have been found, but was not, in cases of pylorospasm, since an alkalosis could be demonstrated by examinations of the blood and urine in eleven infants less than 3 months of age; with one exception all had been fed on human milk. In mild cases the alkalosis was a compensated one, but the extreme to which it might

reach was shown by the time it took for the restitution of a normal ammonia coefficient, a normal chlorine balance and the disappearance of the alkaluria. This would appear to mean that the present teaching of the genesis of spasmophilia should be revised. Why was it that no signs of this disease appeared? The first link of the chain of pathologic metabolism was in the insufficient secretion of the stomach which must have been secondary to the loss of hydrogen and chlorine ions. The examination of the contents of the stomach was difficult on account of the vomiting and the inability to feed an amount of food that should be taken by normal infants, to obtain comparative figures. A preliminary washing out of the stomach was an important step in avoiding getting an acid value that would be too high because of retained food. It may be that a diminished amount of chlorine is the answer to the question, since it has been shown that in solutions containing chlorine with the same amount of calcium carbonic acid and phosphorus there is a smaller dissociation of calcium than in solutions containing no chlorine. A lack of chlorine ions such as exists in pylorospasm must increase the dissociation of calcium and diminish the peripheral irritability. The chlorine impoverishment was probably of greater degree than in adults with tetany of the stomach, since it was of longer standing. It was more probable, however, that the dissociation of calcium was influenced more by the demonstrated lowering of the rest nitrogen. Probably both factors work together but how, no one knows.

Whatever the general opinion is as to the genesis of pylorospasm, it is plausible that it is a part of a vicious circle following a disturbance of the acid base equilibrium and an increased irritability of the pylorus. The addition of the acid to the food should break up the circle. To determine the value of acid treatment was difficult, but the general condition of the infants was improved; the vomiting ceased shortly, and the weight curve began to climb rapidly. How the hydrochloric acid acts on pyloric irritability is unknown. To add the necessary amount of acid, which was considerable, 36 cm. of normal hydrochloric acid to 1 liter of human milk, without rendering the milk unpalatable, was made possible by the addition of 2 per cent plasmon. If one considers that pylorospasm is almost exclusively a disease of boys one is led into the field of endocrinology which is unpleasant but cannot be denied.

THE USE OF EGG AS AN ANTIDIARRHEIC IN THE FOOD OF INFANTS. ARVO YLPPÖ, Ztschr. f. Kinderh. **41**:240, 1926.

The use of egg as a food for infants is of long standing and was early employed in the treatment of diarrhea. It fell into disrepute, however, because of the experience of men like Pfaundler and Vogt, who found that with its continued use as a food the infants failed to thrive, and Lust could not understand how the use of albumin water could find any friends at all in the treatment of diarrhea. The finding of anaphylactic appearances in animals also was prejudicial.

The pendulum has swung the other way. It is disputed now as to whether there is a specific skin reaction to egg, and Noeggerath and Reichle declare that American authors have made faulty interpretations of what really is a traumatic reaction. The swing is also shown by the feeding of egg yolk by Hess and other American workers. Ylppö believes that the pendulum swung too far away from the feeding of egg and has as evidence his own experience in the last five years in the treatment of 300 infants and children, most of them admitted to institutions for intestinal upsets. At first egg-white was used, then the yolk, raw or cooked, and finally for the last three years only cooked

whole egg. For new-born infants and for those up to 1 or 2 months old, a fresh egg is added to half a liter of cooked fresh milk, stirred constantly, and to this is added half a liter of oatmeal water and 5 per cent sugar; the whole mixture then is cooked. For infants a little older, from 4 to 6 per cent of wheat flour is used instead of oatmeal with from one-half to three-quarters liter of milk and 50 Gm. of sugar. Children aged 6 months are fed egg soup, which is composed of one egg; 700 cc. of milk; 300 cc. of water; 30 Gm. wheat flour, and 50 Gm. sugar. The wheat flour is cooked in 1 liter of water for five minutes; the egg is added to the milk and sugar while cold, and the whole combined slowly while stirring constantly. This has been the only treatment used for diarrhea for the last few years. Egg also has been added to human milk for the treatment of intestinal disturbances and intoxication in very young infants, but the mixture has to be cooked. A number of infants were in institutions in which they could be watched for months and years. In one group, Ylppö found in fourteen children, from 7 to 12 days to 4 or 5 months old, that egg soup used as a food by itself at first and then with other food was quite satisfactory. The infants thrived, and there was no appearance of diarrhea or of skin rashes. It is fair to say that the infants were skillfully nursed also and were well guarded from contagion, which would ruin the results of the feeding of any food. Ylppö believes that the much feared sensitiveness to egg in infants occurs astonishingly seldom and that when it does occur it is in a mild, transient form.

In another group of 286 children from 10 days to 2 years old, egg soup was used in the treatment of diarrhea. Finkelstein's albumin milk is of high value, but it is difficult for mothers to make at home. On the other hand, eggs can be procured anywhere and are particularly valuable for their content of mineral salts which are necessary to replace those lost in loose stools. The infants are fed on tea for the first twelve or twenty-four hours and then with egg soup according to age, starting with from 100 to 250 cc. and gradually increasing the amount. In only two did egg seem to be poorly tolerated—once in a child with chronic intestinal indigestion and again in an infant 4 months old who showed on three different trials a real sensitiveness, but on a second admission at the age of 20 months tolerated egg well. Many children vomit egg at first but soon become accustomed to taking it. Sometimes, after a severe diarrhea, soon after the use of egg, the stools acquire a salvy appearance, but no signs of fermentation can be demonstrated. Egg used in the treatment of diarrhea is just as satisfactory as albumin milk.

BUTTERMILK AND WATER METABOLISM. W. RÖCKEMANN, Ztschr. f. Kinderh. **41**:241, 1926.

It is true that by the use of buttermilk and lactic acid milk water is retained in the body, but it is mostly by the process of forming soap stools and by the retention of salts and not by the diminution of the excretions of urine. As a matter of fact, the urine output is increased. The result is the same in the use of hydrochloric acid milk also, so that the occurrence is not an accidental one and is not due to a low fat and a low sugar content of the food. Hydrochloric acid is eliminated as primary phosphate. Added organic acid, on the other hand, is burned; however, not all of it is burned, and an acidosis occurs but not one of high degree. How does acidosis act on the water economy? It has been found that it diminishes the capacity for water-binding, but then how can one explain the increase in weight that depends on water retention? It

must take place by a decrease in the insensible perspiration. The water-binding power of salts is small compared with the diuresis due to acid, but the water retention occurs in spite of diuresis.

THE INFLUENCE OF THE FEEDING OF SMALL ADDITIONS OF ALBUMIN ON THE SECRETION OF PEPSIN IN INFANTS WHO ARE NOT THRIVING ON THE BREAST. MARIA COMBERG, Ztschr. f. Kinderh. **41**:249, 1926.

The gain that breast-fed infants begin to show after the addition of small amounts of albumin is due, it has been established, to the albumin and is not a question of calories. Is there a special need for albumin or is there some substance lacking in the food that has a specific power to stimulate ferments in the digestive processes? It is known that the pepsin content of the gastric juice is increased by a diet rich in albumin. Comberg, therefore, determined the pepsin content of the gastric juice in infants who were progressing poorly by means of a special standardized diet of 100 cc. of a 2 per cent mondamin (starchy food) solution, a test that was determined only after many trials. She found that the best time to recover the solution from the stomach was after twenty minutes. The gross method was used for estimating the amount of pepsin. Two cases are reported in which it seems that there was a relation between the addition of small amounts of albumin and an increase in the secretion of pepsin. Since it happened both in a diet rich in albumin and in a diet poor in albumin, the activity of the albumin can be looked on as specific.

INFECTION AND NUTRITION. SIEGFRIED LEVY, Ztschr. f. Kinderh. **41**:279, 1926.

The aim of institutions should be to provide for the mental and physical development of their charges so that they will compare favorably with children brought up at home. As to mental training, too many children assigned to one caretaker hinders the realization of this ideal. It is difficult also to attain the proper physical development, but it can be helped by the avoidance of grippal infections or at least by minimizing their effects. Two hundred and forty infants who were admitted to an institution in the last four years and who remained longer than four weeks are reported. They were admitted because of the lack of suitable care or for underdevelopment. There were a great number of infections, but only three children died of bronchopneumonia. The index of infection, that is, the number of times a child became ill in a definite period, was when the children were kept in the institution six months, 1.84, and when they were kept for one year, 3.12. The index for cases in private families was 3. There was a specially high incidence of infections in January and February, a smaller one in October and a low incidence in November. The continued good condition of children during an infection is not dependent on any mixture of food such as fat meal, milk, starch and sugar, or malt soup, but is dependent on a sufficient energy content. It was not shown in these cases that it was necessary to use acid milk. In some cases, to make sure that a sufficient amount of calories was given, it was necessary to use concentrated food.

EMERSON, Boston.

DIFFICULTIES IN BREAST FEEDING. K. STOLTE, Zentralbl. f. Gynäk. **50**:2507 (Sept. 25) 1926.

Active tuberculosis is considered the only definite contraindication to breast feeding. Acute infectious diseases, common colds, eclampsia, menstruation, and

mastitis are not indications for weaning. There are two periods — three and seven weeks after delivery — when the amount of milk secreted by the breasts is diminished. These were noted quite regularly in wet nurses in the hospital. The first period is thought to be due to an increased physical activity on the part of the mother. An hour's rest in the morning and afternoon improves the condition rapidly. Lessening of the hormonal stimulation to lactation following complete involution of the uterus may account for the second period. An increased demand on the breast at this time is beneficial.

When the breast is not emptied completely a vicious cycle arises. Incomplete emptying because of pain from fissured nipples or respiratory difficulty, etc., in the infant results in an overdistended breast. This makes it difficult for the infant to grasp the nipple properly; he bites and injures it still more and obtains little milk. The increase in the residual milk results in milk stasis. An erroneous diagnosis of an infection often is made and the part put at rest, which aggravates the condition still more. The proper procedure, if stasis or an early mastitis is present, is to empty the breasts manually and then to continue nursing, applying the infant (especially in cases of fissure) so that not only the nipple but also some of the surrounding tissue is taken between the lips. Manual emptying of the breasts by an experienced nurse is the method of choice. A severe mastitis practically never occurs in the clinic at Breslau, because all patients having early cases are treated in the conservative manner described.

BRAHDY, New York.

Prenatal Conditions

CONGENITAL ABSENCE OF TIBIA. E. L. EVANS and N. R. SMITH, Arch. Dis. Childhood **1**:194, 1926.

A complete study is made of this anomaly defined as "the absence at birth of the tibia in whole or in part, the lower limb being nevertheless present with its different segments well developed in their essential parts." The deformity is one of the rarest of congenital malformations. Clinically, there is shortening of the leg, flexion and adduction of the leg on the thigh and inversion of the foot on the leg. Three new cases are described, and a complete anatomic description is given. Three theories of etiology are given: germinal, mechanical and traumatic. One hundred and five known cases have been recorded. The cause is a defective development of the mesoblast under an influence at present unknown, but not traumatic, mechanical, vascular or atavistic.

PETERMAN, Milwaukee.

A CASE OF UNILATERAL HYPERTROPHY. B. SOUTAR SIMPSON, Edinburgh M. J. **33**:623 (Oct.) 1926.

The description and photograph of a girl, aged 8, reveal a marked hypertrophy of the left leg, not of the true variety, but an overgrowth caused by a congenital defect of the vascular system. The photograph shows remarkable varices of the entire leg, which in the groin are enlarged to form a tumor, a cavernous venous angioma. Not only are the circumferences of the leg several inches greater, but the leg and foot are definitely longer.

NEFF, Kansas City.

Diseases of the New-Born

CHILD LIFE INVESTIGATIONS. A CLINICAL AND PATHOLOGICAL STUDY OF ONE THOUSAND SIX HUNDRED AND SEVENTY-THREE CASES OF DEAD-BIRTHS AND NEO-NATAL DEATHS. COMPILED BY EARDLEY L. HOLLAND AND JANET E. LANE-CLAYTON. Privy Council of Medical Research Council, Special Report Series, no. 109.

This is an exhaustive report by the Medical Research Council on the causation of prenatal and neonatal deaths. A clinical and pathologic study of 1,673 cases of still-births and neonatal deaths has been tabulated in forty-six tables. All of the tables are of clinical interest, while a majority are startling in their disclosures. For example, it was shown that 24.3 per cent of the still-births were due to diseases of the father and mother, of which albuminuria caused 12.1 per cent and syphilis, 9.5 per cent. Pelvic deformities accounted for 33 per cent of the still-births and placenta praevia, 22.1 per cent.

Infections play a large part in neonatal deaths. Eighty-eight of ninety-seven infants died of infective or inflammatory troubles.

In the study of intracranial lesions, it was found that one fourth of all the deaths were due to intracranial injuries. Tentorial tears occur in one half of all cases of spontaneous breech delivery, and interference with forceps causes the same proportion of tentorial tears in all cases. Also, intracranial lesions were found in about one third of all cases of version.

Four hundred and sixty-five of the total deaths were due to complications of labor. Of these, 175 were due to contracted pelvis, 142 to abnormal presentation, and fifty-eight to prolonged labor. If pelvic contractions could be discovered sufficiently early before the onset of labor, there can be little doubt that measures would be taken that would result in a saving of infant life and maternal suffering.

Of the sixty-seven deaths due to albuminuria in the mother, in two cases only was it stated that no albumin was found. If the urine of women were examined repeatedly during pregnancy, there would be less need for rapid intervention and manipulation in cases of toxemia.

Deaths due to fetal states were surprisingly small, only 138 being recorded. Of these, anencephaly caused thirty-nine, hydrocephalus, twenty-eight, and general edema of the fetus, twenty-two.

The results of these statistics show that a high proportion—not less than 25 per cent and perhaps more—of all still-births are due to the accidents and complications associated with manipulation by the midwife or doctor at birth, whether by forceps or version or in other ways. They show the desirability of reducing to the minimum the occasions for interference with natural birth, and they point to more and better antenatal supervision of expectant mothers and to the advice and safe-guards that come from it, as being the true line of immediate preventive progress.

SANFORD, Chicago.

CEREBRAL BIRTH INJURIES AND THEIR RESULTS. F. R. FORD, Medicine **5**:121, 1926.

It is not possible to reach any final conclusions about the exact limits of the group of cerebral birth palsies from the evidence available. The cases of spastic paralysis have been difficult to analyze, and in many cases a satisfactory neurologic examination has not been possible. Few patients with intracranial hemorrhage who survived could be found and these have not been followed long enough. The pathologic anatomy is meager and usually imper-

fectly described and studied. Before any clear understanding of the problems can be secured a large series of detailed pathologic anatomic studies must be made, with adequate clinical control. However, unsatisfactory as the material may be, certain impressions have been gained in the course of this investigation which it seems permissible to state in the form of tentative conclusions.

First, convincing evidence has been gathered that the congenital diplegias which constitute by far the largest group of infantile spastic palsies, as seen in the pediatrics department (235 of 280 in all), are not to be attributed to meningeal hemorrhage at birth, but are the result of various pathologic processes of intra-uterine origin. Four principal arguments support this conclusion. Meningeal hemorrhage is in at least half the cases unilateral, and when bilateral is almost always unequal on the two sides; cerebral diplegias are, with few exceptions, bilaterally symmetrical. The heads of patients with diplegia are usually either definitely microcephalic or slightly below normal size; meningeal hemorrhage causes rapid enlargement of the head. Children who are known to have intracranial bleeding at birth or in infancy do not develop cerebral diplegia. Lastly, the pathologic anatomy of true congenital diplegia is such that it cannot be reconciled with any theory of birth injury.

If the foreging statements are correct it will be seen that cerebral birth injuries are rare rather than common, and the great mass of infantile palsies can no longer be lightly attributed to faulty obstetric procedures.

No final statement can be made about the relation of intracranial birth injury and chronic hydrocephalus. Undoubtedly, marked enlargement of the head may occur, with extensive bleeding into the ventricular system or subarachnoid spaces, but in most cases the blood is eventually absorbed without leaving any permanent obstruction to the circulation of cerebrospinal fluid. Possibly, in some cases, chronic hydrocephalus may result from plugging of the aqueduct by a blood clot or a bit of necrotic brain tissue, and organization of the obstruction. It seems likely that some children with large heads and congenital asymmetrical spastic paralyses owe their condition to birth injury. Intracranial hemorrhage is not uncommonly an accidental complication of congenital hydrocephalus because these infants have large heads and thin skulls.

The common diffuse meningeal hemorrhage which is not large enough to cause death apparently leaves no residuum in the overwhelming majority of cases. The real birth injuries to the brain are caused by the rarer intracerebral hemorrhages and necroses, by depressed fractures with laceration of the brain and, undoubtedly, by some more or less encapsulated meningeal hematomas which compress and soften the cortex. All the evidence which the writer was able to collect seems to indicate that the true cerebral birth palsies are represented by the congenital hemiplegias, the monoplegias and the asymmetrical and unequal bilateral spastic paralyses. The children have large or normal heads, even in some cases asymmetrical heads. Their intelligence is on the average much greater than that of the diplegic patients. A history of birth injury may be obtained in a large percentage of such cases and the pathologic anatomy is quite consistent with the hypothesis of gross birth injury. Of course, it is realized that assymetrical congenital defects of the brain are included with these cases and are probably clinically indistinguishable from them. Numerically this group, which the writer believes is principally composed of true cerebral birth palsies, is surprisingly small, just seventeen of 280 infantile cerebral palsies in the Harriet Lane Home records, if the five asymmetrical diplegias are excluded. These figures would mean that about 6 per cent of all infantile cerebral palsies are due to birth injury, but the group

is not well enough defined to attempt any numerical estimation. Recurrent convulsions occur in about one-third or more of these cases, and it has already been concluded that about 2 or 3 per cent of all epilepsies seen in children are related to birth injury. Severe grades of mental defect are probably not related to birth injury with the exception of that type which develops in association with frequent convulsions. Tredgold estimates that not more than 1.5 per cent of patients suffering from dementia who die in asylums owe their condition to birth injury and it seems probable that these figures are approximately correct.

AUTHOR'S CONCLUSION.

EDEMA OF THE LUNGS IN THE NEW-BORN. R. DEBRE, Q. SEMELAIGNE and A. COURNAND, Presse méd. **163**:1617 (Dec. 25) 1926.

In the cases observed, the infants were perfectly normal for the first week of life. There was no history or symptoms of syphilis or tuberculosis. During the second week occasional periods developed in which the child was cold, and later cyanotic. These attacks increased in frequency, and the cyanosis became the principal feature. The respirations became difficult and all food was vomited, mixed with a glary mucus.

The physical examination revealed no abnormalities except in the lungs. When the ear was held to the child's back, fine râles at the end of inspiration could be heard. These were identical with those of pulmonary edema. The roentgenogram showed the hilum and the mediastinum of the lungs to be normal. In several cases, the remainder of the lung resembled that of bronchopneumonia; in others it was normal. Bacteriologic examination in two instances showed the pneumococcus; otherwise it was negative. The origin was therefore not determined. The prognosis was good; only two infants died, one from digestive disturbance and one from purulent pleurisy. The treatment was entirely symptomatic.

SANFORD, Chicago.

NECROSIS ADIPOSA NEONATORUM. G. GELBJERG-HANSEN, Arch. f. Dermat. u. Syph. **152**:91 (Nov. 13) 1926.

Gelbjerg-Hansen condemns the name scleroderma neonatorum for subcutaneous fat necrosis in the new-born, and proposes that given above. He affirms that this is a clearly demarcated and typical disease picture which cannot be confused with any other. The etiology is unknown, but he suggests a pancreatogenous origin. In the case described by him, the disease made its appearance when the child was 4 days old, with dark red patches on the outer side of both arms and in the left infrascapular region. Apparently the entire thickness of the skin was infiltrated. In the course of the next eighteen days, similar infiltrations appeared on the right shoulder (the size of a child's hand), on the outer surface of each thigh (2 by 5 cm.), on the back over the angle of the left scapula and on the left hip (8 by 4 cm.). Thirty-seven days after the onset, the skin was found entirely normal, the infiltrations had disappeared and atrophy was not present. Microscopic examination of a portion of one of the infiltrated patches showed that the seat of the disease was the subcutaneous fatty tissue, the necrosis of which was accompanied by considerable inflammatory reaction. The general health of the affected infants does not appear to suffer and the skin lesions clear up without treatment. This is the first case described from Denmark. Reports of twenty cases were found in the literature.

ZAPFFE, Chicago.

LENGTH AND WEIGHT OF THE MATURE FETUS IN THE LIGHT OF VARIATION STATISTICS. E. WEHEFRITZ, Arch. f. Gynäk. **129**:227 (Sept. 2) 1926.

In determining the normal limits of the length and weight of mature new-born infants, arithmetric averages now are used. Wehefritz, by applying variation statistics to 8,848 mature new-born infants, presents formulas and curves for determining the limits of body length and weight and their relation to each other. For the mathematical details it is necessary to read the original article. He considers a new-born infant mature, if it can thrive without special care. The extremes in length are 12 cm. and in weight 3,150 Gm. apart. A wider range of normal weight to height is brought out. An infant 48 cm. long may weigh from 2,117 to 3,737 Gm., or one from 56 to 59 cm. long may weigh from 3,090 to 5,192 Gm. The average length and weight are practically the same as those obtained by the arithmetric averages.

BRAHDY, New York.

MORPHOLOGY AND ORIGIN OF HEMORRHAGES CAUSED BY BIRTH TRAUMA, OCCURRING IN THE BRAIN and SKULL OF THE NEW-BORN. P. SCHWARTZ and LOTTE FINK, Ztschr. f. Kinderh. **40**:427, 1925.

This is a long, interesting, and well illustrated article, describing the venous circulation of the brain, and giving the most frequent sites of hemorrhage in the new-born due to injury during birth, and the explanation of how and why they occur. Conclusions are drawn from a study of more than 300 postmortem cases, of brains injected with dyestuffs, and of brains of animals in which hemorrhages were produced by a bell jar and suction. The brains were hardened in situ and removed as a whole. The dye substance consisted of Berlin blue and iodine gelatin. Intracerebral hemorrhages, pial effusions, and disturbances of the circulation of the dura, the diploe, and the scalp, form an interdependent complex, the components of which occur in typical combinations. The most important cause is the application of force, that is, the marked difference in pressure between the contents of the uterus and the outside world, during the expulsion of the baby. It is in that part of the infant which is subjected to the least external pressure that the damage is done. The point of application of the damaging force is the venous system, not the arterial system of the brain and skull, frequently in the region drained by the vena magna galeni, in three places especially, namely (1) The frontoparietal region, drained by the vena terminalis. Of this type there were more than 100 examples; (2) the parietotemporal region, drained by the vena lateralis ventriculi, and (3) the posterior horn region, drained by the ventricular branch of the vena basalis. The great majority of microscopic bleedings occur in premature babies, the hemorrhages in full term babies being ray-form or punctiform in character, but in general the hemorrhages in both kinds of babies are alike in kind and localization. Microscopic bleedings into the corpus callosum, and pial hemorrhages are frequent. The cortex and stem ganglions usually escape hemorrhage because of the arrangement of the venous circulation, which is distributed mainly to the medullary portion of the brain, and because of anastomoses and possibly because these regions are supplied by what amounts to an independent arterial system. Places shown to be the most frequent sites of softening of the brain tissue coincide with the most frequent sites of hemorrhage. Asphyxia is of secondary importance as a cause of hemorrhage.

EMERSON, Boston.

Acute Infections

VARIOLA. A CLINICAL STUDY OF THE MINNEAPOLIS EPIDEMIC OF 1924-1925. S. E. SWEITZER and KANO IKEDA, Arch. Dermat. & Syph. **15**:19 (Jan.) 1927.

Of the cases of smallpox occurring in Minnesota between 1913 and 1923, 1.7 per cent occurred in persons who had been vaccinated successfully within seven years; 4.2 per cent in persons vaccinated more than seven years before and 94.1 per cent in those never successfully vaccinated. Of the 108 deaths, 107 occurred in the unvaccinated group and one among those vaccinated more than seven years before. In the Minneapolis epidemic of 1924, not one of the 365 deaths occurred in individuals who had been vaccinated successfully within seven years.

JEANS, Iowa City.

THE PROPHYLACTIC USE OF MEASLES CONVALESCENT SERUM. WILLIAM H. PACK and ROWLAND G. FREEMAN, J. A. M. A. **87**:556 (Aug. 21) 1926.

Injection of 6 cc. of measles convalescent serum or plasma in a child under 3 years of age, and from 6 to 10 cc. in a child over that age who has been exposed for less than five days, is usually sufficient to prevent infection, and if it does not, it almost certainly will modify the severity of the disease. Prompt use of the serum will prevent serious outbreaks of measles in institutions, and will so prevent the development of complicating pneumonias. The immunity lasts from two weeks to one month. In the modified cases there is lasting immunity. The serum gives the greatest accumulation of antibodies shortly after convalescence, although at three months antibodies are still present to some extent. If the attempt were made to withdraw between 10 and 25 cc. of blood in every case seen in children, and larger amounts in adults, the physician would have enough for the majority of the exposures in his practice.

THE PROPHYLACTIC VALUE OF BLOOD OF CONVALESCENTS IN MEASLES. SIDNEY V. HAAS and JULIUS BLUM, J. A. M. A. **87**:558 (Aug. 21) 1926.

It is difficult to procure a sufficient supply of blood of recent convalescents to cope with an epidemic in an institution of fair size. It has been found practical to bleed recent convalescents in small amounts to inject in exposed children in an institution. Plasma of convalescents collected from one to four months after defervescence and stored for four and one-half months gave protection in 51 per cent of the patients for three months or more, while plasma collected one month after defervescence protected 88 per cent for three months or more. When such plasma failed to protect, it modified the disease in 100 per cent of the children. There was little difference in the protective value of the injections between the fourth and seventh day after exposure. Injections after the seventh day did not protect or modify the disease. Whole blood in amounts from 5 to 7 cc. collected up to three months after defervescence protected 41 per cent for two months or more. When the whole blood failed to protect, it modified the measles even when it developed two months after injection. Considering the small amounts of plasma or blood injected, an incidence of measles of 53 per cent in inoculated children, as compared with 84 per cent in those not receiving protection, is noteworthy. The permanent immunity following the modified form of measles is of benefit in an institution caring for children. A noticeable phenomenon of this epidemic was the decidedly smaller incidence of bronchopneumonia in the children inoculated.

AN OUTBREAK OF POLIOMYELITIS APPARENTLY MILK BORNE. A. C. KNAPP, E. S. GODFREY and W. L. AYCOCK, J. A. M. A. **87**:635 (Aug. 28) 1926.

In a small epidemic of poliomyelitis in a city of 15,000 all but one case occurred in persons who drank milk from one dealer who sold less than 4 per cent of the city's total supply. The cases were distributed widely enough to make it improbable for the epidemic to be a mere coincidence of geographic distribution. Furthermore, an actual paralytic case existed on the dairy farm from which the milk came, and this patient milked the cows and handled the milk for a period of four days during the acute stage of the disease. These facts, together with the fact that the time which elapsed between this period and the time of onsets of the subsequent cases was consistent with the generally accepted minimum and maximum incubation periods of poliomyelitis, seem to speak for a milk borne epidemic. The authors, however, are not of the opinion that this is the usual mode of spread of poliomyelitis.

BONAR, Salt Lake City.

STUDIES IN SCARLET FEVER. I. THE AMOUNT OF SCARLATINAL TOXIN IN THE BLOOD OF PATIENTS WITH SCARLET FEVER. JAMES D. TRASH, J. Clin. Investigation **3**:391, 1926.

In an earlier paper the author, together with F. G. Blake, reported results obtained by the intracutaneous injection into susceptible subjects of 0.3 cc. of serum from patients with scarlet fever. The amount of toxin in the serum was estimated by the severity of the reaction. In this study the amount of toxin was estimated according to skin test doses. The least amount of patient's serum that would give a reaction 1 cm. in diameter in twenty-four hours was determined. Next, the least amount of a standard filtrate toxin that would give the same reaction in the same person was determined. The number of skin test doses in 1 cc. of the patient's serum is estimated directly by comparison of the dilutions.

It was found from a study of twenty-five cases that the toxin content of the blood serum in cases of scarlet fever varies through an extremely wide range. This does not always run parallel with the clinical estimate of the severity of the case. Because of this discrepancy, it is suggested that a generous excess of antitoxin should be used if the best results are to be obtained.

LESLIE, Chicago.

THE SEROLOGICAL CLASSIFICATION OF HEMOLYTIC STREPTOCOCCI OBTAINED FROM CASES OF SCARLET FEVER. J. SMITH, J. Hyg. **25**:165, 1926.

Hemolytic streptococci have been obtained from throat cultures in 92 per cent of cases of scarlet fever in the first two days of the disease. Strains from 210 cases were found to belong to two main serologic types, type I strains being obtained from 119 cases, and type II strains from fifty-seven cases. Strains obtained from cases occurring in members of the same family were found to be mainly of the same serologic type. Strains obtained from cases in small isolated outbreaks were found to be of the same serologic type.

A SKIN REACTION IN POLIOMYELITIS. EDWARD C. ROSENOW, J. Infect. Dis **38**:529, 1926.

The absence of marked reactions in persons fully recovered from poliomyelitis and who are known to be immune; the incidence of positive reactions

inversely according to age, corresponding in general to the age incidence of poliomyelitis; the strongly positive reactions during the acute stage of the disease, and the negative reaction during convalescence, are considered as presumptive evidence that the test is a measure of susceptibility to poliomyelitis.

Numerous questions regarding the nature of the reaction have not yet been worked out. However, the immune serum prepared from horses with the pleomorphic streptococcus, and used with apparent benefit in the treatment of the early stages of poliomyelitis, has a marked neutralizing power over the toxin, as determined by the skin reaction.

FURTHER STUDIES OF THE POLIOMYELITIS PRECIPITIN REACTION. EDWARD C. ROSENOW, J. Infect. Dis. **38**:532, 1926.

The results of the precipitin reaction with immune horse serums and extracts of nasopharyngeal swabbings in community and institutional outbreaks of poliomyelitis proved positive in nearly all frank and abortive cases at the time of the attack, in a high percentage of normal contacts and in persons not exposed to the disease at the time when cases occurred. It proved negative in nearly all of the cases in from two to three weeks after the acute attack had subsided and in normal persons soon after the epidemic had disappeared. In one epidemic, the incidence of positive reactions generally was found low shortly before the occurrence of the first case, high during the period of the epidemic and again low after the epidemic had subsided. The increase in positive reactions as cases of poliomyelitis developed and the decrease as poliomyelitis disappeared, occurred rapidly and seemingly independently of exposure to the disease, in isolated households in the country as well as in the urban populations. Persons who were negative to the precipitin reaction on entrance into the epidemic zone soon became positive and reactions resembling abortive attacks of poliomyelitis were common in children. The number of positive reactions in persons who came to the Mayo Clinic from widely separated communities was relatively high during the latter part of August when poliomyelitis was generally prevalent and much lower during the latter part of October after poliomyelitis had largely disappeared. After the epidemic in Rochester had subsided and the precipitin reaction in the population had become largely negative, cases occurred south of Rochester where the number of positive precipitin reactions was high.

In certain instances poliomyelitis occurred without exposure within from five to twelve days after the presence of the streptococcus was demonstrated in the throat. Repeated swabbings showed that the carrier state lasts usually from one to three weeks in normal persons. Immunity to poliomyelitis and the occurrence of the organism in the throat did not run parallel. The positive reactions during epidemics in adults, who are relatively immune, and in children, who are relatively susceptible, were found nearly equally high, and persons who had had poliomyelitis became carriers of the streptococcus during epidemics, quite like persons who had not had the disease.

THE PRECIPITIN REACTION IN THE IDENTIFICATION OF SCARLATINAL HEMOLYTIC STREPTOCOCCUS INFECTIONS. EDWARD C. ROSENOW, J. Infect. Dis. **39**:141, 1926.

The close agreement between the specific precipitating power of the serum, prepared by the injection of suspensions and cultures of the hemolytic streptococcus from scarlet fever, and the antitoxic serum, prepared by the injection

of filtrates or toxin of scarlatinal hemolytic streptococci, suggests that sufficient bacterial substance goes into solution in their cultures to make their antitoxic serum suitable for the diagnostic precipitin reaction.

AUTHOR'S SUMMARY.

EARLY DIAGNOSIS AND TREATMENT OF POLIOMYELITIS. FRANK C. NEFF, J. Missouri State M. A. **23**:285, 1926.

The author deals especially with the recognition of the disease before paralysis sets in and treatment before severe injury to the nerves has occurred. One half of all the patients have no paralysis.

The earliest diagnostic symptoms and signs, Neff believes, are an incubation period of from a few days to a week, prodromal symptoms of from a few hours to three days, inflammation of the mucous membrane of the nose, throat and mouth, large and reddened tonsils, herpes, toxic vomiting, and fever from 102 to 105. The child is fretful, irritable, apprehensive, emotional and uncomfortable; the neck may be rigid; there may be spinal pain and hyperesthesia; the breathing is quickened. Tendon reflexes are irregular and are lost on the affected side. The blood picture does not help, though a leukocytosis is present. The pulse rate is more rapid than it should be for the fever. The spinal fluid is abundant and under pressure; the cell count is higher then normal; sugar is not present.

In the treatment, intraspinal injection even of convalescent serum is disappointing, but intramuscular and intravenous injections appear of value. Neff advises spinal drainage daily if the pressure is increased.

SCHORER, Kansas City, Mo.

THE TOXEMIA OF SCARLET FEVER. CHARLES W. DUVAL, Southern M. J. **19**:858, 1926.

Experimental work carried on by the author leads him to conclude that the active principle of scarlatinal streptococci is endotoxic in kind and is responsible for the toxemia of scarlet fever. There are two forms of the toxemic state, one, which may be termed the primary, is due to the whole streptococcal protein; the other, termed the essential, is caused by a lysin-liberated endotoxin. The second or essential toxemia, the author believes, causes the rash, nephritis and other significant lesions of the disease. All pathologic change in the condition is caused primarily by the direct action of the lysin-split endotoxin and is not due to a soluble toxin elaborated by the streptococcus in vivo.

SOME MEASURES FOR THE PREVENTION OF DIPHTHERIA. WILBURT C. DAVISON, Southern M. J. **19**:865, 1926.

The most efficient means for the prevention of diphtheria is by immunization of all children. The author is under the impression that injections of anatoxin or diphtheria toxoid produce immunity more rapidly than inoculation with toxin-antitoxin and have the advantage over the latter in that they contain no horse serum.

SCHLUTZ, Minneapolis.

ETHER IN THE TREATMENT OF THE SECONDARY PNEUMONIAS OF CHILDHOOD. G. M. LYON, West Virginia M. J. **22**:229, 1926.

The author classifies the secondary pneumonias as those following measles, pertussis, influenza, etc., and reports fifty-eight cases treated with ether; some intramuscularly and some by rectum, in olive oil.

Compared with other lines of treatment, the results in these cases were considered a great improvement; "Namely, earlier termination of the infection, shorter and more satisfactory convalescence and a decrease in the incidence of both complications and deaths."

SHAWKEY, Charleston, W. Va.

CARBOHYDRATE METABOLISM IN DIPHTHERIA. FRANCIS J. HECTOR, Lancet **2**:642, 1926.

In severe diphtheria, during the toxemia and acidosis, carbohydrate metabolism is disturbed; fasting blood sugar is abnormally low, and the ability of the tissue to utilize glucose is diminished.

[ARCH. PATH.]

SCARLATINA, DIPHTHERIA AND MEASLES. THEIR RELATIONS AND INTERRELATIONS: FROM THE MEDICOSOCIOLOGICAL STANDPOINT. ALEXANDER JAMES, Edinburgh M. J. **33**:161 (Sept.) 1926.

The writer discusses the factors of constitutional strength and fitness possessed by individuals through heredity and acquisition which influence their resistance to infection and to the virulence of disease. From the contagious wards of the City Hospital, he compiled a table of the history incidence of other infections that the patients having scarlatina and measles and the diphtheria carriers had had, and he includes for comparison the histories of about 1,000 boys in school. Only children over 5 were considered.

AN INVESTIGATION OF A CASE OF RAT-BITE FEVER. CLINICAL AND BACTERIOLOGICAL OBSERVATIONS. GERTRUDE M. A. HERZFELD and T. J. MACKIE, Edinburgh M. J. **33**:606 (Oct.) 1926.

Rat-bite fever is rare in Scotland. This carefully studied case showed the characteristic symptoms and the ready cure by arsphenamine. Not until the glands became markedly enlarged at about four weeks was it possible to demonstrate *Spirillum* by direct methods, but the specific organism was found in guinea-pigs inoculated with the gland tissue. Another organism was grown from the patient's blood, a small gram-negative motile bacillus resembling the coli-typhoid group. This organism on continued culture underwent changes which took the forms of filament and vibrio and showed a definite agglutination reaction with the patient's serum. The writers assume that this organism, *Spirillum minus*, developing in blood culture, represents a secondary blood infection, and that biologically there is no relation between this second spirillum and the specific of rat-bite fever.

NEFF, Kansas City.

MALTA FEVER IN INFANCY. POESTI-SEMINERIO, Arch. de méd. d. enf. **29**:700, 1926.

Malta fever in children under 4 years always has been considered extremely rare. Italian authors, however, have collected from the medical literature of the Mediterranean countries many instances of invasion in infants. Cannita reports twenty-seven cases; Cantani, Luna, DiCristina and others have added personal experiences with this disease among children under 4. The author publishes the clinical histories of a number of infants suffering from Malta fever. He believes it is entirely probable that many cases in children may be obscured and unrecognized on account of coexisting conditions such as typhoid,

paratyphoid, enterocolitis, leishmaniasis and malaria. Exact diagnosis can be made only through the cooperation of the laboratory. Treatment is as unsatisfactory among infants as among adults.

AMESSE, Denver.

BLOOD GROUPS IN INFANTS. R. DEBRÉ and M. HAMBURGER, Compt. rend. Soc. de biol. **94**:1196, 1926.

In fifty-six of eighty-seven cases did the blood group of the infant correspond to that of the mother. Examination for agglutinogens and agglutinins was made in fifteen cases. In two thirds of them the infant's blood corresponded to one of the four blood groups in adults. A total lack of agglutinins was noted in one third of the cases, a partial in one case. Their results correspond to those of Happ, and they disagree with Decastello and Sturli who believe that the appearance of agglutinins precedes that of agglutinogens.

ON THE SIGNIFICANCE OF THE PSEUDO- AND ANA-REACTIONS WITH DIPHTHERIA TOXIN. A. BACCICHETTI, Boll. d. Ist. sieroterap. Milan **5**:145, 1926.

The pseudoreaction and the anatoxin reaction are both due to the hypersensitivity of the skin to the diphtheria proteins. Because heating the protein produces no change, the anatoxin reaction is more constant. The pseudoreaction varies with the individual, like the Pirquet test, depending on the skin sensitivity for intensity and duration, and has a bearing on the antitoxin response to vaccination. The Schick reaction is positive during the course of the disease, and quickly becomes negative after even small doses of antitoxin. A strong pseudoreaction indicates a favorable prognosis. In measles the pseudoreaction as well as the Schick reaction is unaffected. In some persons with a positive Pirquet reaction the pseudoreaction may last for years, while in others, especially in those vaccinated or those who have had diphtheria and received serum treatment, it disappears in a short time.

AUTHOR'S SUMMARY.

PNEUMONIA IN INFANCY. PAUL HEIM, Monatschr. f. Kinderh. **34**:129, 1926.

In the collapse occurring in pneumonia and associated with signs of circulatory failure, severe dyspnea and enlarged liver, the author has resorted to the old procedure of giving from 20 to 80 cc. of a 10 per cent solution of glucose intravenously. This he combines with 0.1 cc. of a 1:1,000 solution of epinephrine hydrochloride. The injection may be repeated every few hours and as often as necessary. Previous authors have ascribed the good results of this treatment to the effect on the heart. Heim, however, believes that the results are obtained by opening up the blood vessels of the liver and facilitating the flow of blood.

GERSTLEY, Chicago.

DICK TOXIN AND SCARLET FEVER STREPTOCOCCI. R. BIELING, München. med. Wchnschr. **73**:1479, 1926.

Strains of streptococci which have no relation to scarlet fever streptococci may yield Dick toxin. For instance, such toxin was obtained from hemolytic streptococci from the blood of patients with puerperal sepsis. Such toxins are neutralized by serum from patients convalescing from scarlet fever. It is

evident that immunity to scarlet fever and insensitiveness to the Dick toxin do not always run parallel.

THE PROBLEM OF THE DEMONSTRATION OF THE MEASLES MICRO-ORGANISM. MAX FLESCH, München. med. Wchnschr. **73**:1480, 1926.

Specimens of blood were taken daily from the daughter of the author. The child had been exposed to measles, and specimens were taken from the third day after exposure. On the seventh day the microscopic examination of the blood showed small rods which increased in number the next day. The examination could not be continued further. Measles developed on the twelfth day after exposure.

TREATMENT WITH ROENTGEN-RAY IN ACUTE INFLAMMATIONS. R. SCHÜLER, München. med. Wchnschr. **73**:1580, 1926.

In acute inflammatory infiltrations with pus formation and erysipelas, treatment by the roentgen ray is better than treatment by the patient's blood.

SERUM THERAPY IN DYSENTERY OF CHILDHOOD. H. KNAUER, München. med. Wchnschr. **73**:1924, 1926.

In cases of bacilluric dysentery in childhood large doses of serum were given intraperitoneally. The mortality of the patients treated with serum was 30.4 per cent and of those not treated, 42.9 per cent. In ten of forty-four cases the bacteriologic examination revealed bacillus "Y" seven times; the Flexner bacillus once; Shiga-Kruse, once, and Gärtner, once. It may be noted that the serum contained phenol of which, therefore, a relatively large amount was injected.

AMBERG, Rochester, Minn.

ANTITOXIC POWER OF MOSER'S SCARLATINA SERUM. JOSEF ZIKOWSKY, Wien. klin. Wchnschr. **39**:1476 (Dec. 16) 1926.

In a small series of Schultz-Carlton tests on patients having scarlatina, Zikowsky obtained distinct blanching with four out of five lots of unconcentrated scarlatina streptococcus antitoxin of Moser. Concentrated Moser serum gave pronounced blanching. Control tests using scarlatina and measles convalescent serums were weakly positive. Anthrax and tetanus serums gave negative results.

The author presents case histories and charts of eleven severely ill patients with scarlatina who were treated by intramuscular injections of from 10 to 30 cc. of concentrated Moser serum. He found that when given early (within from three to five days after the onset) the serum caused a rapid decline in fever, exanthem and other toxic symptoms. Unconcentrated serum was used in two cases and was found ineffective.

R. KRAUSE, Wien. klin. Wchnschr. **39**:1479, 1926.

In an extended discussion of Zikowsky's paper, Krause emphasizes the specificity of toxins of the different streptococci and the variation in the ability of horses to produce potent scarlatina streptococcus antitoxin. In the past the principle objection to Moser's serum has been its unconcentrated form and its undeterminable potency. Now, thanks to Dick's discovery of a skin test, Moser's serum can be assayed quantitatively.

OLMSTED, Seattle.

THE VALUE OF THE DICK TEST. K. KUNDRATITZ, Ztschr. f. Kinderh. **40**:573, 1925.

Sixty-eight and four-tenths per cent of two hundred and seventy-two healthy children reacted positively to the Dick test, but 46 per cent of twenty-six children who had had scarlet fever reacted positively also. Of thirty-six children, five had a negative test at the beginning of scarlet fever, and of the remaining thirty-one, only eleven had become negative at the end of the sixth to the eighth week. Injection of scarlet fever convalescent serum was not successful in making negative Dick tests in children in whom the test was positive. Mixed with streptococcus toxin, in vitro, convalescent serum diminishes the toxic action producing the skin reaction, but the reaction is still positive. The capacity of a serum to blanch the exanthem of scarlet fever does not always parallel a negative Dick test. Accordingly, the Dick test for the diagnosis of scarlet fever is not of the significance, reliability and strict specificity attributed to it by its discoverers, and the majority of investigators, and is not of the same value in scarlet fever as a Shick test is in diphtheria. The question of the etiology of scarlet fever has not been completely solved by considering *Streptococcus hemolyticus* as the cause.

EMERSON, Boston.

Chronic Infections

A STUDY OF LUES AMONG MENTAL DEFECTIVES. FRANK R. HALL, Am. J. Syph. **10**:563 (Oct.) 1926.

Hall reports a survey of 3,750 mentally defective male children. A routine blood Wassermann test was made and found positive in forty-three instances, or an incidence of 1.15 per cent. These figures were found comparable to those of several authors. Of the forty-three patients, ten were found to have eye lesions, five of which were interstitial keratitis.

THE MODERN TREATMENT OF CONGENITAL SYPHILIS. HENRY HEIMAN, Am. J. Syph. **10**:577 (Oct.) 1926.

Once the spirochetes have become disseminated throughout the body, as evidenced by the secondary eruption, it is a herculean task to rid the body of infection. It is extremely difficultt and usually impossible to cure a patient if treatment is not instituted within six weeks of the initial infection. A fetus may be infected any time after the fifth month, though infection usually occurs during the last three months. Thus the patient may have been infected from three to five months prior to birth.

For this reason every pregnant syphilitic woman should receive treatment, with the hope of preventing the infection of the infant, or of treating the fetus before it becomes hopelessly infected.

The treatment should be continuous, i. e., from 6 to 10 weekly injections of some arsenical followed by six weekly injections of mercury. Bismuth may be used in place of mercury. This method of treatment has been carried out for one year with no deleterious effects. The author regards the prognosis for cure in children above two or three months of age as hopeless, but proper treatment may arrest the progress of the syphilitic parasite.

He emphasizes the desirability of prenatal treatment.

BISMUTH. WILLIAM H. GORDON and MILTON S. FELDMAN, Am. J. Syph. **10**:588 (Oct.) 1926.

The authors review the early history of bismuth in regard to treatment for syphilis. Their article brings out the following points: Bismuth when given intramuscularly is said to be more efficacious than if given intravenously; however, the authors' experience with its intravenous use has been gratifying. They found that the toxicity of bismuth was independent of the preparation used, and dependent on the following factors: (*a*) too rapid absorption; (*b*) accumulative action; (*c*) overdosage; (*d*) faulty elimination; (*e*) poorly cared for mouth; (*f*) faulty technic; (*g*) idiosyncrasy. The toxicity is manifested mainly in the kidney and to a less degree in the liver. Glossitis and enteritis are seen but are of less importance.

The various preparations of bismuth are absorbed at a different rate when given intramuscularly, the usual extremes being from twenty-eight to sixty-three days. Another series showed extremes of from six to twenty-seven days. The biweekly injections are condemned because of the danger of cumulative action. The roentgen ray can be utilized to determine the rate of absorption from the site of injection. The authors' patients received 100 mg. of bismuth weekly without severe toxic symptoms. The rate of absorption and excretion can be determined adequately by analysis of the urine.

Bismuth was found to be of value in all cases of tertiary syphilis but of little or no value in the primary or secondary stage; it is of special value in cases showing intolerance to the arsenicals.

In general, the intramuscular route is preferred in the use of bismuth, but the authors have used it intravenously also with good results. It has been found to be about 33⅓ per cent more effective when used in conjunction with potassium iodide.

The authors advocate alternate use of bismuth and mercury in conjunction with an arsenical.

THE REACTIVATION OF SALVARSAN IN THE TREATMENT OF SYPHILIS. C. N. MYERS and J. ARNOT MACGREGOR, Am. J. Syph. **10**:604 (Oct.) 1926.

The authors believe that after long arsenic therapy the body may become supersaturated with arsenic. They have found that the administration of sodium thiosulphate often will produce a favorable effect both on the serologic and the clinical manifestations of the patient.

McBRIDE, Iowa City.

STOVARSOL IN THE TREATMENT OF SYPHILIS. FRANK M. CREGOR and FRANK M. GASTINEAU, Arch. Dermat. & Syph. **15**:43 (Jan.) 1927.

Stovarsol administered by mouth had a remarkably beneficial effect in primary, secondary and tertiary cases. In primary cases the infection apparently was aborted. In the secondary and tertiary cases, the clinical symptoms were controlled promptly, and serologic improvement was noted. The systemic reactions to the drug were slight; the tolerance to it seemed high, and its efficiency was comparable to that of neoarsphenamine.

JEANS, Iowa City.

THE DECLINE IN THE REGISTERED MORTALITY FROM SYPHILIS IN ENGLAND. TO WHAT IS IT DUE? ARTHUR NEWSHOLME, J. Soc. Hyg. **12**:513 (Dec.) 1926.

A survey of statistics for England and Wales shows that registered mortality from syphilis, general paralysis, tabes dorsalis and aneurysm has

diminished abruptly about 30 per cent since 1918. It is admitted that these statistics are only a fraction of those for the total mortality due to syphilis, but they serve as an index of the trend of the whole. Most of the deaths attributed directly to syphilis occur in infancy. The values would indicate that infant mortality from syphilis has diminished by half since 1917.

The period of correlation represents a fourth of a century. During that period the disease has been recognized more completely; in addition, educational work, the free distribution of arsphenamine and the free diagnosis and treatment have resulted in a change in the ratio of the various forms of syphilitic death. Infant mortality naturally would respond to improved control more quickly than would the late vascular and nerve lesion types.

Venereal control during the war was able to check the spread of infection during that period. Since that time the momentum of the war campaign may be credited with the lowering of the former level of mortality. Apparently, prophylaxis has not been a marked factor in lowering the mortality, except in military groups. The author quotes a recent Belgian review, citing similar observations in that country. The chief feature of the work accomplished has been prophylaxis by treatment.

BOYD, Iowa City.

HOW TO PREVENT CHILDHOOD INFECTION FROM BECOMING ACTIVE TUBERCULOSIS LATER IN LIFE. F. M. POTTENGER, Northwest Med. **25**:646 (Dec.) 1926.

Newer conceptions of tuberculous infection and immunity began with the work of Pirquet, who found that the skin of persons infected acquired a hypersensitivity to bacilli or their products. It was found that the greater the age, the greater the incidence of positive skin tests. Also, the greater the age, the less the mortality, and the more frequently healed lesions were found. The test then is an indication of an immunity reaction and an attempt of the body cells to destroy an invading organism. Children are usually infected through milk or through exposure to actively diseased patients. When a child is first infected, there is a response of the body cells to invasion by organisms in an attempt to surround and destroy them. Many adult infections are due to metastasis from these childhood lesions — the smaller each metastasis, the higher the immunity produced.

It is especially desirable to shield children from infection during their earliest years, to protect them from infected milk, and guard them from exposure to tuberculous parents and nurses. When once infection has occurred, the possibility of activation by metastasis should be borne in mind.

SCOTT, Philadelphia.

THE HEART IN CONGENITAL SYPHILIS. R. DUPERIE and G. CANTORNE, Le Nourrisson **14**:298 (Sept.) 1926.

This article is based on postmortem examination in fifteen cases of congenital syphilis; one slightly macerated fetus was born dead and the remaining fourteen infants died during the first few weeks of life. In nine instances, *Treponema* was demonstrated in the cardiac muscle. Macroscopically the hearts were somewhat enlarged, soft, flabby and of poor color, but none showed any congenital malformation. Microscopic examination revealed changes in the muscle fibers, the blood vessel walls and in the interstitial tissue. The authors, however, do not consider these changes as being typical of syphilis. The finding of *Treponema* somewhere in the cardiac tissue is necessary for a positive postmortem diagnosis of syphilitic carditis.

MCCLELLAND, Cleveland.

RECOVERY FOLLOWING INTRALUMBAR TUBERCULIN TREATMENT IN A CASE OF TUBERCULOUS MENINGITIS. KARL NEIDHARDT, München. med. Wchnschr. **73**:823, 1926.

A boy, aged 12 years, whose spinal fluid showed tubercle bacilli, received ten lumbar punctures, and 0.05 mg. of old tuberculin in 20 cc. of physiologic sodium chloride solution was injected three times after the lumbar puncture.

THE TREATMENT OF SYPHILIS WITH NATIVE SPIROCHETE MATERIAL. HILGERMANN, München. med. Wchnschr. **73**:979, 1926.

In certain cases, Hilgermann injects intravenously a material obtained by irritation of a primary lesion, by aspiration from lymph glands, or from a chondyloma. He claims to have obtained early immunity in this way. The treatment is combined with arsphenamine.

RECOVERY IN A CASE OF TUBERCULOUS MENINGITIS. OTTO WIESE, München. med. Wchnschr. **73**:1937, 1926.

In this case meningeal symptoms supervened on tuberculosis of the joints. The urine of the patient contained tubercle bacilli, as did the fluid obtained by lumbar puncture. After the onset of meningeal symptoms, 60 cc. of fluid was removed and 3 cc. of this injected intragluteally. At the same time, 1 cc. of 1:1,000 old tuberculin was injected. The child recovered. Later the right kidney was removed because of tuberculosis.

AMBERG, Rochester, Minn.

THE CAPACITY FOR RESOLUTION OF INFILTRATION OF THE LUNGS IN TUBERCULOSIS OF CHILDREN, ON THE BASIS OF FOURTEEN CASES OBSERVED. W. FRIEDENBERG, Ztschr. f. Kinderh. **40**:493, 1925.

Sometimes children infected with tuberculosis, especially those in the first year of life, may become ill with high fever, cyanosis, dyspnea, and even diarrhea and vomiting, or without alarming symptoms other than more or less severe cough, and rise in temperature in the evening. Measles, grip and inflammation of the lungs are given in the history, and occasionally are, in reality, the forerunners of this complication. Examination of the lungs on admission gives either flatness, which may extend over an entire lobe and more, with greatly diminished breath sounds, or there may be no flatness at all, and one may hear crackling râles over the whole lung, which disappear with increasing formation of the infiltration. It is possible for the roentgenogram to show a wide and dense shadow, such as would never be expected by percussion. Gradually the infiltration becomes demonstrable by percussion also, but puncture with a needle yields nothing. The alveoli are filled with epithelial cells and fluid rich in albumin. Friedenberg maintains that the infiltration is not a specific bacillary, but a specific toxic process. The infiltration may increase in size during observation, remain the same, or resolve to a degree which varies according to the time of examination. By auscultation, one hears greatly diminished breathing, but one may hear bronchial breathing, and even amphoric breathing during the course of the disease, and some coarse râles. Especially astonishing is the subjective sense of wellbeing of the child, which does not stand at all in comparison to the objective findings in the lung. The temperature returns to normal in a proportionally short time, in children with an acute onset with high fever, and in children with a subfebrile temperature. The tuberculin test is strongly positive in all children.

The sputum may or may not show tubercle bacilli, without the resolution of the infiltration being influenced. The cough may be severe as in pertussis, or may be mild or entirely absent. The duration of the resolution cannot be foretold, but in all cases it extends over many months, in one case, ten months, without a change. In another case there was at the end of two years a trace of the infiltration to be seen by roentgen ray. Follow-up of these children shows the majority were not especially disturbed in their development. The prognosis must be guarded.

EMERSON, Boston.

Internal Diseases

THE EFFECT OF EMOTION ON CERTAIN CASES OF ASTHMA. LLOYD H. SIGLER and DAVID C. ELLIOTT, Am. J. M. Sc. **172**:860 (Dec.) 1926.

Emotions or psychic stimuli seem to induce bronchial asthma in a limited number of people without a history of protein sensitization. The authors studied a number of patients with a history of asthma associated with psychic stimuli and who were under the influence of emotion at the time. The respiratory curves taken on these patients during such an interval showed considerable alteration in the amplitude and regularity but no change in rate. The expiratory phase was lengthened and a slight increase in pulse rate was noted. Patients whose asthma was explained on a protein basis showed no such changes.

PARSONS, Ann Arbor.

OBSERVATIONS ON THE RHEUMATIC NODULE. VINCENT COATES and CAREY F. COOMBS, Arch. Dis. Childhood **1**:183 (Aug.) 1926.

The literature is reviewed briefly, and Coates' previous conclusions regarding the rheumatic nodule are repeated — "The center of the lesion is a thrombosis, around which is a zone of extraordinarily rich and exuberant proliferation of fibrous and endothelial cells, these last throwing off not only detached uninucleate cells, but also new capillary buds in great numbers, and forming, possibly as an early phase of this budding the multinucleate cells that are so striking a feature of the rheumatic reaction." It is suggested that the nodules demonstrate the existence of a subpalpable phase of infection.

Rheumatic nodules were found in eighteen of twenty-three children with a history suggesting rheumatic infection. Seventy-seven children with no such history showed no nodules.

Subcutaneous nodules of the millet seed type indicate that the barriers of immunity are being assailed successfully and that the result hangs in the balance.

PETERMAN, Milwaukee.

ANTIBODY RESPONSE AFTER IMMUNOTRANSFUSION IN MALIGNANT ENDOCARDITIS. KATHARINE M. HOWELL, BERNARD PORTIS and DOROTHY A. BEVERLEY, J. Infect. Dis. **39**:1, 1926.

In a case of acute malignant endocarditis, both *Streptococcus hemolyticus* and *Streptococcus viridans* were isolated from the blood on three different occasions.

During a period of five months the patient received twelve transfusions of immune whole blood.

Before immunotransfusion was begun the blood serum contained no agglutinin for the streptococci isolated. The opsonic index was 0.57 and the complement-fixation reaction with streptococcus antigen was weakly positive.

The serum of the donors at the time of transfusion had an agglutinin titer of 1:10,240 or 1:20,480.

The agglutinin titer of the recipient's serum increased after each transfusion, reaching after the later ones a figure higher than that of the transfused blood.

The opsonic index of the recipient's blood serum also increased after each transfusion, as a rule running parallel with the agglutinin titer, and reaching values higher than those of the transfused blood.

Complement-fixing antibodies also increased, but appeared later than agglutinin and opsonin and fluctuated more irregularly.

The increase in specific antibodies of the recipient's blood, as compared both with its own original content and with that of the immune donors, is interpreted as evidence of the development of active as well as passive immunity as the result of immunotransfusion.

At variable periods, usually from two to three weeks, after each transfusion the agglutinin and opsonin titers of the patient's blood dropped suddenly to low figures, reaching a maximum again usually within twelve days after the next transfusion.

AUTHORS' SUMMARY.

CHRONIC HEREDITARY AND FAMILIAL HEMOLYTIC JAUNDICE WITH SPLENOMEGALY AND HEPTAMEGALY: OBSERVATIONS ON FIVE CASES UNDER STUDY. WALTON FOREST DUTTON, M. J. & Rec. **124**:530 (Nov. 3) 1926.

The characteristic features common to chronic hereditary and familial hemolytic jaundice are the marked increase in the number of reticulated red cells and the great fragility of the red cells when exposed to hemolytic agents. The course of both is in many ways the same: it is one of crisis followed by periods of remission, not necessarily fatal. The cases under study represented three generations. Jaundice had been present from birth. The author also gives a full report of five cases. Among these patients were a mother, her two daughters and her grandson, the son of one of the two daughters.

The treatment of this disease should not be confused with that of splenomegalic jaundice, hemolytic icterus or congenital hemolytic jaundice. These conditions are similar to the disease under discussion but strictly speaking are pathologically different, and for this reason the surgical and nonsurgical methods of attack are essentially diverse. Crises come at much shorter intervals in the more severe conditions. Essential prophylactic measures, such as proper diet, fresh air, regular exercise, sunlight, freedom from excitement and protection from infections, should be taken to prevent a crisis.

Iron, arsenic and nuclein plus heliotherapy have proved useful therapeutic agents. Iron, arsenic and nuclein were administered by mouth and hypodermically with only fair results. The best results have been secured by the intravenous method. All symptoms improved in the three cases of the series treated without operation, and in the cases in which operation was performed, the patients responded unusually well. From this study it must be inferred that the close cooperation of surgeon and internist will prove the solution of the problem presented by the two diseases.

WILLIAMSON, New Orleans.

HYPOGLYCEMIA DUE TO INSULIN IN CHILDREN. G. A. HARRISON, Brit. M. J. **2**:57 (June) 1926.

It is not widely known that the level of blood sugar at which symptoms of hypoglycemia occur is decidedly lower in children under 12 years of age than in adults. There is some variation in the level at which symptoms arise following the administration of insulin in diabetic adults. This is observed not only when comparing one patient with another, but also in repeated observations on the same patient. In the author's experience he has found the blood sugars in adults to range between 50 and 130 mg. when reactions have occurred, while in children, when hypoglycemic reactions occurred, the blood sugar was found to range between 28 and 45 mg. The reaction in children is not nearly so well defined as in adults, for one has to rely on objective signs almost exclusively. The first signs in Harrison's experience were pallor, unusual quietness, lassitude and a tendency to doze and when examined, fretfulness and a greater tendency than usual to weep.

Regarding therapy, the author offers nothing new except a caution against giving too much carbohydrate in order to avoid a hyperglycemia and the suggestion that the sugar should always be given in solution in order to facilitate absorption. He further stresses the fact that exercise in children should be carefully regulated, as it is difficult or impossible for them to gage this for themselves as adults do.

BROWN, Toronto.

OSSIFYING SPONDYLITIS. RALPH STOCKMAN, Edinburgh M. J. **33**:597 (Oct.) 1926.

Among other adult patients reported, Stockman includes two whose disability dated back to rheumatism in childhood, from which a progressive irritation and inflammation of fibrous tissue resulted in ossification of the joints. The condition affects the vertebral articulations especially, and finally causes rarefaction of the involved vertebrae from partial disuse. Treatment is of value only in the early stage of the disease, for which protein-shock therapy with intravenous typhoid vaccine is recommended. Massage and passive movements may ameliorate the condition.

NEFF, Kansas City.

BILATERAL CHYLOTHORAX AND SPONTANEOUS PNEUMOTHORAX IN A TUBERCULOUS CHILD AGED THREE YEARS. GERTRUD REME, Monatschr. f. Kinderh. **34**:135, 1926.

Reme reports a case in which the etiology probably was due to rupture of the thoracic duct by erosion from a tuberculous bronchial lymph node. The child recovered.

POSTGRIPPAL MYOCARDITIS. KARL KLINKE, Monatschr. f. Kinderh. **34**:139, 1926.

Klinke reports a case in which cardiac dilatation following an attack of influenza caused some confusion in diagnosis. The author believes that one should be on the watch for myocarditis following influenza just as carefully as that following the onset of diphtheria.

GERSTLEY, Chicago.

THE TREATMENT OF ORTHOSTATIC ALBUMINURIA WITH A CRAWLING EXERCISE. OTTO WIESE, München. med. Wchnschr. **73**:1275, 1926.

The author describes a peculiar crawling exercise, which starts with the knees flexed at right angles and the arms stretched flat on the floor to as far

above the elbow as possible. The idea is to produce lordosis in the upper part of the spinal and kyphosis in the lower part, taking the load off the inferior vena cava.

THE RELATION OF SPECIFIC HEMOLYSIS TO THE DECREASED RESISTANCE OF ERYTHROCYTES AND ITS CLINICAL SIGNIFICANCE, PARTICULARLY IN HEMOLYTIC ICTERUS. A. WOLFF-EISNER, München. med. Wchnschr. **73**:1316, 1926.

It has been claimed that the sensitization with the hemolytic amboceptor also reduces osmotic resistance of the red blood cells and that therefore the two manifestations observed in hemolytic icterus, the occurrence of the hemolysis and the reduced osmotic resistance, are due to one cause. In a series of experiments in rabbits there was no striking difference in the persistence of the red cells in the sensitized and nonsensitized animals. There is no proof that the hemolysins would play a rôle in the causation of hemolytic icterus.

"SUN-BRONCHITIS" IN CHILDREN WITH EXUDATIVE DIATHESIS. KURT KLARE, München. med. Wchnschr. **73**:1440, 1926.

The greater number of children with exudative diathesis are of the flax blond type. They also may show marked reactions to exposure to sun in the form of extensive, lasting bronchitis.

ASTHMA AND SILICON. GOSWIN ZICKGRAF, München. med. Wchnschr. **73**:1477, 1926.

In twenty cases of asthma, intravenous injections of silicon have been used. In some the asthmatic attacks disappeared entirely; in other cases there was an occasional attack but it was much lighter than the previous ones. At first the dose is 0.01 Gm., and later 0.02 Gm. If several doses of 0.01 Gm. have been given without disagreeable manifestations, the dose of 0.02 Gm. is easily tolerated. Three intravenous injections are given weekly for three or four weeks, then two injections weekly for three or four weeks, and then one injection weekly for three or four weeks. Altogether, the treatment lasts from ten to fourteen weeks. If necessary, the course is repeated after an interval of three or four months. The author uses various silicon preparations, either sodium silicon in 2 per cent solution or a commercial preparation made for intravenous injection.

THE CLINICAL SIGNIFICANCE OF THE QUANTITATIVE EXAMINATIONS FOR DEFENSIVE FERMENTS. ALBERT LAHMANN, München. med. Wchnschr. **72**:1507, 1925.

The quantitative determination of the Abderhalden reaction with various organs and at different times with the same organ as sub stratum is regarded by the author as an important aid in clinical diagnosis. It thereby becomes possible to treat different forms of adiposity.

EXPERIENCE WITH HEMOPROTEIN. HANS KNAUER, München. med. Wchnschr. **72**:1513, 1925.

Hemoprotein is animal blood used for intravenous injection in tuberculosis. It was given to eight children, who received twenty-six injections in all. It was given when the stomach was empty. At no time was there any indication of hemolysis.

HIRSCHSPRUNG-GALANT INFANTILISM. JOHANN SUSMAN GALANT, München. med. Wchnschr. **73**:1881, 1926.

By Hirschsprung-Galant infantilism is understood an infantilism which developed on the basis of a megacolon congenitum. The author reports the first case of this type in a girl, aged 22.

A PECULIAR CASE OF LIPOMATOSIS ATROPHICANS. STRIECK, München. med. Wchnschr. **73**:2029, 1926.

Lipomatosis atrophicans is a relatively rare disease characterized by a symmetrical lipomatosis and a high degree of atrophy of the subcutaneous fat tissue. The case presented is that of a girl, aged 6 years. The lipomatosis was noted when the child was 3 months old as a tumor of the hip. An illustration shows the distribution of the lipomatosis. The basal metabolic rate in this case was plus 32.6 per cent. The head of the child was extraordinarily large.

AMBERG, Rochester, Minn.

THE RÔLE OF CONSTITUTIONAL AND CONDITIONAL FACTORS IN THE PATHOGENESIS OF BRONCHIAL ASTHMA. KARL HAJÓS, Wien. Arch. f. inn. Med. **13**:193, 1926.

On the basis of a study of general development of the body and configuration of the thorax of 164 asthmatic patients, the author attempts to arrive at a constitutional type characteristic of the asthmatic. He found that eosinophilia could be regarded in the light of a constitutional stigma in only about 53 per cent of the cases. Infectious diseases play a considerable rôle in the etiology of attacks. Tuberculosis of the lungs and apical bronchitis were uncommon developments or complications.

SCHLUTZ, Minneapolis.

FURTHER RESEARCHES ON GOITER IN CHILDHOOD. 3. GAS AND IODINE METABOLISM IN THE GOITER OF ADOLESCENCE. A. ECKSTEIN and E. MOMMER, Ztschr. f. Kinderh. **40**:475, 1925.

Goiter was studied in eighty children at the age of puberty by the Knipping modification of the Benedict method. About from 10 to 15 per cent of this number who live in Freiberg, where goiter occurs endemically, were found to have symptoms such as tachycardia, lability of the vasomotor system, sweating, pseudoanemia, and are classed under the title hyperthyroid disease of puberty. The same percentage is found in goiter free communities, according to Finklestein. Most children with enlarged thyroids, both authors agree, are free from objective and subjective symptoms. They show a completely normal condition of the gas metabolism. There is no condition here of hypothyroidism, and accordingly no treatment is indicated. This, however, must not be taken to mean that when goiter is endemic, prophylactic treatment is unnecessary; quite the contrary, for by such treatment some children who would come to surgical treatment for relief of mechanical pressure are able to avoid it, and some children are saved future trouble in adult life.

The exhibition of iodine in small or in large doses had no effect on the gas metabolism. Pfaundler said that the good effect of iodine as a prophylactic measure was no evidence of the causative lack of iodine in the genesis of goiter. In one case of an enlarged thyroid removed from a child who had been treated with iodine for a long time, there was an excess of iodine in

the gland, but the child had not improved. Moreover, iodine is eliminated in twenty-four to forty-eight hours in a majority of cases. The action must be catalytic.

THE NORMAL THIRD HEART SOUND IN CHILDREN. L. D. STEINBERG, Ztschr. f. Kinderh. **40**:620, 1925.

Once more the occurrence of a third heart sound in normal children is confirmed as almost universal. Since it is two hundred times weaker than the second sound, special training of the ear is necessary. One can hear it best with the ear alone, between the sternum and mammary line, at the third and fourth ribs, better in expiration; in protodiastole, but in mesodiastole, if the heart is slowed down. It is to be heard better with the patient horizontal, preferably just after he changes from the vertical position, and sometimes it can be brought out by pressure over the liver. It is not heard in some instances with every cycle, and there are pulse frequencies at which it disappears. It is normal for children from 4 to 14 years of age.

ATROPINE METHYL NITRATE: ITS USE AND A DISCUSSION OF THE PATHOGENESIS OF PYLOROSPASM. W. USENER, Ztschr. f. Kinderh. **41**:176, 1926.

The dose of atropine methyl nitrate for infants is from 0.25 to 0.4 mg. for a single dose given five to ten minutes before a meal; total daily dose consisted of from 2 to 3 mg.; it may be given in the form of a 0.1 per cent solution, from five to eight drops repeated six times.

In recommending atropine methyl nitrate for the treatment of pylorospasm, the author realizes that opinions as to the genesis of this disease are conflicting, that the clinical course of an individual case cannot be judged by considering only the spastic symptoms and that when spastic conditions alone are considered and treatment directed accordingly, success will not occur in every case.

For the understanding of pylorospasm one must consider (1) spasm, (2) hypertrophy, and the causal relation of one to the other. The spastic component is the governing one; i. e., it is the primary and real cause of the clinical picture, its development and its chief symptom, and the severity of the disease runs parallel with the degree of the spastic closure. As evidence Usener considers (1) the severity of the vomiting which bespeaks a temporary and complete blockade but which is never so bad but that in moderate, and in the beginning even in severe, cases a relaxation of the spasm can occur and food pass through the pylorus; (2) the disappearance of the severe spasm and of the vomiting after some time, without any untoward after-effects; (3) the more or less long duration, at the longest to the age of 6 or 9 months, of the palpable tumor at the pylorus and of the peristalsis even when the infant is gaining weight and there is a normal tolerance for food; (4) the essentially different pictures of pylorospasm and pyloric stenosis.

The spastic component then is primary. In the second stage of the disease, a hypertrophy of the muscle arises to compensate for the increased amount of work of the propelling antrum and then of the contiguous wall of the stomach. In some cases, i. e., the third stage, a synergistic spasm of the whole antral portion of the stomach develops. A firm and relatively extensive closure of the pyloric end of the stomach shuts off the flow of the stomach contents into the duodenum, and this blockade cannot be overcome by the compensatory hypertrophy of the neighboring wall. Clinically, these cases are characterized by a

quickly increasing intolerance of food at single feedings shown by regular vomiting, stagnation of food and the rapid appearance of hunger. The transition from the first to the second stage occurs probably the more quickly the younger the infant is, and the transition from the second to the third stage the more severe the disease.

There is also another and more rare disease, a neuropathic pylorospasm. It is a neurosis of the stomach, primarily of the secretory kind, and is secondary to pylorospasm of different degrees of severity but does not lead to hypertrophy. It is identical with the neurosis of the stomach of adults.

AN ADENOMA OF THE PARS PYLORICA IN A YOUNG INFANT. FRITZ DEMUTH, Ztschr. f. Kinderh. **41**:252, 1926.

The youngest patient previously reported as having an adenoma of the pylorus was 10 months old, but the patient here described was 11 weeks old, and the tumor was not an additional symptom but the cause of death. The child vomited from birth and showed visible peristalsis but no palpable tumor. By means of the roentgen ray, no food could be seen to pass through the pylorus in five hours. A sound could be passed, but the general condition was so poor that feeding by the tube was out of the question, and operation was refused. The infant died two days after admission. An autopsy showed, on the small curve of the stomach immediately in front of the pylorus, a tumor, 8 cm. in diameter, which completely closed the opening. The tumor was embedded in the musculature and was made up of a mass of glands but had no connection with the mucous membrane of the stomach. The best explanation of the tumor is that it was a congenital hyperplasia of Brunner's glands. A tumor also was present in the duodenum; it was composed of pancreatic tissue but had no connection with the pancreas itself. By early diagnosis, which was perhaps possible, and operation, this infant might have been saved.

THE PROGNOSIS OF CONGENITAL TUMORS OF THE KIDNEY. JACOB SOMMER, Ztschr. f. Kinderh. **41**:256, 1926.

Malignant tumors of the kidney in the first five years of life are relatively frequent and afterwards are rare. The type most often seen is a malignant teratoma which was seen in the four cases here reported, all in infants under the age of 22 months. All of them were operated on and showed sarcomas. Two patients died because of widespread metastasis and two are living, one three and one-half months after operation and one seventeen months after, both in good condition. The first was operated on three days after the first symptom was noticed, and the second at three months when the tumor was first palpated at a clinic for well babies. It would seem that with early diagnosis and operation the prognosis for malignant tumors of the kidney of this kind is better than has been considered previously.

BUILDING, GROWTH AND DEVELOPMENT OF THE BODIES OF DIABETIC CHILDREN. R. PRIESAL and RICHARD WAGNER, Ztschr. f. Kinderh. **41**:267, 1926.

A careful analysis of the growth of diabetic children will show anomalies of constitution, such as arthritis, defects of vision, lordosis with albuminuria and dwarfism, in a great percentage of cases, etc. In the family history endogenous diseases of degeneration, such as nephrolithiasis and obesity, are demonstrable. Juvenile diabetes often occurs as an hereditary disease, as was shown

in the case of homologous twins. Diabetes in children is not, as it is in adults, a disease seen especially in the Jewish race. This was found in agreement with Joslin. The increase in weight of diabetic children in relation to age does not vary from that of normal children; rather, the increase in weight of the majority of children treated successfully is often a little more than that of healthy children of the same age. Diabetes has no specific retarding influence on the increase in length when the patient is treated. A sacrifice in height at the cost of a gain in weight as emphasized by Joslin could not be demonstrated. Treatment with insulin as compared with dietary treatment shows no difference in its influence on the body weight. It should not be said that either of the two methods of treatment can be said to be better than the other; each one has its own indication and what the difference will be in the long run no one can say. The expected weight of treated diabetic children compared with their length does not differ from the normal; only this comparison can be used as a measure of the condition of nutrition. "The sexual development of diabetic children seems assured" (Joslin).

EMERSON, Boston.

Nervous Diseases

MONGOLIAN IDIOCY IN TWINS. GRAEME MITCHELL and HAROLD F. DOWNING, Am. J. M. Sc. **172**:866 (Dec.) 1926.

The authors report a case of mongolian idiocy in twins. The birth was uneventful. Two placentas and two complete membranes were present. The patient, a boy, had all the mongolian facies when 2 months old. The twin brother was not a mongol and developed normally, both physically and mentally. Including the present case, there are twenty-four instances of mongolism in twins reported in the literature. In fifteen of these the condition was present in only one of the children, the other, a normal twin, being of the opposite sex in eleven cases and the sex not being stated in the remaining four. In three cases mongolism occurred in both twins, the sex being identical. In six cases mongolism occurred in one of the twins of the same sex, in four of which there were two placentas present at birth. In the other two the condition of the placenta was not stated. The authors feel that these facts were in favor of the theory of mongolism being a defect in the germ plasma and were against any theory which holds that the causes operating during pregnancy are at fault.

PARSONS, Ann Arbor.

JUVENILE PARESIS. ITS SALIENT CHARACTERISTICS, WITH SPECIAL REFERENCE TO INFANTILISM. HENRY A. BUNKER, JR., Am. J. Syph. **10**:553 (Oct.) 926.

There have been from 275 to 300 cases of juvenile general paralysis reported since 1877. Between 1 and 2 per cent of congenital syphilitic patients develop general paralysis. The sexes are equally affected, while in adults the males predominate by a ratio of between 1:2.5 and 1:4. The delusions of grandeur are almost totally absent in juvenile paralytic patients. The juvenile patient usually lives four or more years from the onset, although there is complete intractability to treatment. Focal signs or symptoms are much more prevalent than in the adult. General paralysis and tabes frequently are combined in juvenile paralytic patients. Arrested development or infantilism is characteristic of this condition.

MCBRIDE, Iowa City.

ACCIDENTAL PERFORATION OF THE ATLANTO-OCCIPITAL MEMBRANE, A. T. HENRY, Ann. Clin. Med. **4**:682, 1926.

Henry tells of a case which emphasizes the vulnerability of the undefended atlanto-occipital space. A boy, aged 12, was accidentally stabbed, while playing with other children, with a piece of iron wire, which penetrated the atlanto-occipital membrane and almost completely destroyed the medulla at the level of the lower end of the olivary body. The case is strikingly similar to that recently described by Weller (Transfixation of the Medulla Oblongata by a Darning Needle, *Ann. Clin. Med.* **4**:107, 1925).

WALTER M. SIMPSON.

PSEUDOHYPERTROPHIC MUSCULAR PARALYSIS. PHILIP LEWIN, J. A. M. A. **87**:399 (Aug. 7) 1926.

This condition is variously known as pseudohypertrophic muscular paralysis, progressive muscular dystrophy, or idiopathic muscular atrophy. Thirty-nine cases were reviewed by the author. The disease is more common in patients in poor social circumstances, and of the thirty-nine patients, only ten were females. The author believes that the greatest progress in the understanding and treatment of this disease will come from careful studies along two lines; viz., carbohydrate muscle metabolism and endocrinology. He recommends a diet rich in all vitamins, large doses of calcium lactate in milk, epinephrine hypodermically or in hypodermic tablets dissolved under the tongue, physiotherapy, and muscle reeducation. One should not be misled by an early improvement in a case.

BONAR, Salt Lake City.

DIAGNOSIS AND TREATMENT OF BRAIN TUMORS. WALTER E. DANDY, Northwest Med. **25**:629 (Dec.) 1926.

As in appendicitis, tumors of the brain have gone through the stages of being unknown, then rare and later less rare, and at present are among the most frequent tumors of the body when checked by operation and necropsy. As in appendicitis, early recognition and efficient operation are of paramount importance. With tumors of the brain, there is the additional factor of difficult localization. Localization has been so difficult that palliative decompression has been in many cases the only thing possible. Cerebral pneumography has been of great aid in perfecting the author's localization. Tumors alter the contours and shift the positions of the lateral ventricles. Ventriculography is a complicated procedure, dangerous in any but the most skilled hands, as air is an irritant and must be removed after the operation and replaced with fluid or saline solution.

CEREBROVENTRICULOMYELOGRAPHY WITH CONCLUSIONS. DORRELL G. DICKERSON Northwest Med. **25**:643 (Dec.) 1926.

From a review of the literature, the following conclusions are reached by the author:

1. There appears not to be any reason why the intralumbar method should not be used.

2. The introduction of air into the spinal subarachnoid space for the diagnosis of cord or intracranial tumors is a safe procedure.

3. In the hands of a skilled brain surgeon, the direct intraventricular injection of air is justified. It is a major operation and cannot be used so conveniently as the intralumbar method.

4. In certain cases, combined intralumbar and intraventricular methods should be used.

5. When the neurologic localization is in doubt, intralumbar injection of air is a safe confirmatory procedure in cases of organic disease of the brain and cord.

6. In cases of so-called idiopathic epilepsy, the intralumbar injection of air will help to eliminate or ascertain the presence and localization of gross pathologic change of the brain.

Scott, Philadelphia.

Endemic Goiter and Intelligence. Robert Olesen and Mabel F. Ferald, Pub. Health Rep. **41**:971 (May 21) 1926.

The survey consisted of a study of 3,796 sixth grade pupils of the Cincinnati public schools, to determine whether endemic goiter influences intelligence. Thyroid enlargement was found in 25.2 per cent of white boys and in 39.6 per cent of white girls. Information afforded by school retardation or advancement as indicated by age, and the records of a standard group test (the Otis test) to measure intelligence were used together to determine the mental rating of the children. Neither of these factors revealed any significant variations between the children with normal thyroid and the children with enlarged thyroid, except those with a marked thyroid enlargement whose intelligence was slightly below normal. The number of children with the marked enlargement was too small, however, to warrant any definite conclusions.

The Sheffield Outbreak of Epidemic Encephalitis. Medical Research Council, Special Report Series, no. 108, September, 1926.

Accurate statistics of this outbreak cannot be given because of the great number of unrecognized mild and abortive cases. Of 301 cases reported, an increased susceptibility to infection in males and a greater mortality in females was found. In males the ages of 15 to 30 showed the greatest susceptibility. Neither social nor sanitary conditions seemed to bear any relationship to the infectivity, as did neither water nor food supply. The council was unable to compute any incubation period or to establish the fact that the disease was spread by direct contact. No definite relationship was found to exist with influenzal infection.

Cerebrospinal fluid obtained from patients during life, emulsions of brains from patients dead of the disease, filtrates of cultures of washings of nasal passages and filtrates of cultures of feces were used to inoculate laboratory animals in attempts to transmit the virus of the disease or its toxins to the animals, but all attempts failed. In all except one, postmortem examination showed perivascular infiltration of some part of the brain, though the parts varied widely. Cerebrospinal fluid was free from acid fast bacilli, and all the cultures reduced Fehling's solution. In nearly all except the cases in which much blood was present, the white cells were below 6 per cubic millimeter and were nearly all of the lymphocytic type.

Clinical symptoms were: (1) general, such as fever, pain in the head, vertigo, etc., and (2) special, as insomnia, delirium, maniacal symptoms, abnormal muscular movements, fits, myoclonus, disorders of the respiratory mechanism, etc. There were also lethargy, ocular palsies, palsies of the other cranial nerves, as well as paralyses and anesthesias. Parkinsonian symptoms began in the acute attack in some cases.

About one half of the cases reported were classified as mild and one fifth as severe. There were more males than females having mild primary attacks,

though this proportion changed with the more severe attacks. Complete recovery occurred more often in the cases of mild primary attack. The death rate was highest in cases showing definite fever, vomiting, and acute respiratory disturbances. Ocular palsies, vertigo and neuralgic pains rarely persisted. Mental disorders continued in about one half of the cases. Sleep disorders persisted over long periods of time, and the type present in the primary attack was the form seen later, this being especially true of insomnia. Parkinsonism was more common in males than in females, and occurred in the greatest number between the ages of 15 and 35. It began most frequently from six to twelve months after the primary attack. About one half of the patients were showing little change when the survey was made; about 8 per cent had died, and the others were getting worse.

Sixteen cases were reported that proved to be diagnosed incorrectly. About one half of these were meningitis, usually tuberculous. Of forty-three fatal cases, forty patients died within two months of the onset of the disease.

BARNETT, Chicago.

INFANTILE PSYCHOLOGY AND PSYCHANALYSIS. R. LAFORGUE and E. PICHON, Rev. franç. de pédiat. **1**:727, 1926.

Under the freudian influence, the study of personality disorders has been pushed back into early childhood and even into infancy. Any shock or condition that throws a child too suddenly or completely on himself for emotional satisfaction may develop a serious affective disorder. Such a child comes to live more and more in his fancies and often develops abnormal habits. Feelings of inferiority exaggerate his separation from others, and frequently he overcompensates with an antisocial attitude. An understanding of the inception of his difficulties is essential to a readjustment, and often this can be obtained only through methods of psychanalysis.

The authors cite the case of a child who was abruptly weaned at 16 months by the mother applying mustard and pepper to her breasts. The immediate emotional shock was such that for many weeks the child showed signs of terror on seing his mother. To assure the evolution of a well balanced personality, the child should experience a gradual emancipation from his mother and his family, substituting at each stage larger groups of interests.

LESLIE, Chicago.

THE WINKING JAW. BABONNEIX and MORNET, Arch. de méd. d. enf. **29**:681 (Dec.) 1926.

An effort is made in this paper to interest pediatricians in a peculiar syndrome long familiar to the neurologist and the ophthalmologist. Known in England as the Marcus Gunn phenomenon and on the continent as "la machoire clignotante," it may be described as a functional synergy in which lowering of the inferior maxilla produces an elevation of the upper eyelid. Its etiology is as yet undetermined, although various causes, such as trauma in utero, diabetes, alcoholism and heredity, have been suggested. It appears certain, however, that it is never associated with syphilis in either the inherited or the acquired form. The syndrome exists from birth and continues through life; it is decidedly more common in males. The degree of elevation of one or both upper lids is directly dependent on the excursion of the lower jaw, and it continues as long as the mouth is open. When only one eye is affected there is usually a marked ptosis of the upper lid. For reasons that also are

still vague, the left eye is more frequently involved than the right. The most complete and exhaustive examination of the eyes and of the nervous system in these cases has yielded negative results. Treatment of any sort is wholly ineffective. The authors stress the menace to the child's pride and point out the unwholesome mental state that may develop readily in a sensitive person from the ridicule of his companions.

AMESSE, Denver.

HEMORRHAGE INTO THE PARATHYROIDS IN INFANTS AND SMALL CHILDREN AND THE SPASMOPHILIA PROBLEM. FELIX DANISCH, Frankfurt. Ztschr. f. Path. **33**:380, 1926.

Erdheim, in 1906, described three cases of infantile tetany in which there was old hemorrhage in the parathyroids. He considered this the etiologic factor in the convulsions of the tetany. Other investigators since that time have obtained contradictory results. Grosser and Betke, in sixteen cases of tetany, found hemorrhage in four cases in one or more of the parathyroids. Hartwich, in twelve cases, found hemorrhage in only one.

Danisch found fresh or old hemorrhage, blood cysts and blood pigment in the parathyroids of infants and children up to 2½ years of age remarkably often, in more than 30 per cent of cases. There is a tendency for the blood to become encapsulated because of a peculiar palisade arrangement of the parenchyma cells. The microscopic picture indicates that the bleeding is by diapedesis. There is no evidence that the bleeding is the result of an inflammatory process. The hemorrhage may be traced often to birth trauma or intrapartum asphyxia but almost an equal number of cases occur later. Fourteen cases of bleeding into the parathyroids are cited. It does not appear that any active organ destruction goes on in the greater number of cases of hemorrhage. In ten cases of rachitis, eight did not show parathyroid hemorrhage. In two cases, Danisch found unmistakable bleeding in single organs which could not in any way be connected with the pathogenesis of spasmophilia. In only one case was there marked destruction of the parenchyma due to hemorrhage. Manifest tetany was present in this case. This was really a hypoparathyroid tetany similar to the postoperative tetany.

E. M. HALL.

ETIOLOGIC SIGNIFICANCE OF INJURY FROM LIGHT RAYS IN THE FREQUENT OCCURRENCE OF TETANY IN THE SPRING. P. KARGER, Jahrb. f. Kinderh. **109**:1, 1925.

Tetany occurs most frequently in the spring, and often many cases are seen within a comparatively few days, then periods of several weeks may elapse before other cases are seen. In some years the number of cases is much greater than in others. The author sees a relationship in this observation to the sudden occurrence of several warm sunny days in succession, in which infants are exposed to the sunshine a great deal after having been deprived of sunlight during the winter months, and in consequence receive an overdosage of sun's rays. Recurrences of symptoms of spasmophilia after apparent cure, he claims, occur more frequently in patients treated at home than in those treated in an institution; this he thinks may be due to too ardent outdoor treatment when at home.

It has been shown that overdosage of ultraviolet light produces an alkalosis usually rather quickly, and the author suggests the possibility that an alkalosis thus produced may be a factor at least in precipitating symptoms of tetany in spasmophilic infants.

Abstracter's Comment: This suggestion at least brings to attention the advisability of more careful technic in ultraviolet ray treatment, and especially in perfecting a method of standardizing dosage and in measuring the strength of the particular tube being used.

PARMELEE, Chicago.

CLASSIFICATION OF TYPES OF IDIOCY AND IMBECILITY. W. WEYGANDT, München. med. Wchnschr. **73**:765, 1926; continued in **73**:828, 1926.

Weygandt classifies cases of idiocy and imbecility in the following manner:

A. Historic grouping.
  1. Mental deficiency due to faulty development.
  2. Arrested mental development due to fault of the organs of sense.

B. Endogenous brain "Anlage" disturbances (germ cell faults).
  1. Anencephaly.
  2. Partial defect of brain.
  3. Microcephaly.
  4. Congenital degeneration of the brain.
     a. Angiodystrophia cerebri.
     b. Status corticis verucosus deformis.
  5. Megalocephaly.

C. Congenital forms of brain degeneration.
  1. Amaurotic familial idiocy.
  2. Aplasia (Merzbacher-Pelizäus).
  3. Hypertrophic, tuberous sclerosis.
  4. Mongolian idiocy.

D. Secondary developmental disorders of the brain with degenerative development of the skull.
  1. Achondroplasia.
  2. Oxycephaly.

E. Exogenous limited forms of idiocy.
  1. Encephalitis.
  2. Meningitis.
  3. Hydrocephaly.
  4. Metencephalitis.

F. Developmental disorders due to syphilis.

G. Mental disturbances due to endocrine disorders.
  1. Dysthyroidism.
  2. Dysthymism.
  3. Dyspituitarism.

H. Infantilism.

I. Mental weakness due to exogenous toxic causes.

J. Epilepsy (idiopathic).

K. Psychotic developmental disorders.
  1. Infantile hysteria.
  2. Infantile dementia.
  3. Schizophrenia.
  4. Cyclothymia.

M. Diseases of the central nervous system (organic).

N. Traumatic disorders of the brain.

THE USE OF PARATHYROID HORMONE IN IDIOPATHIC TETANY. H. BEUMER and C. FALKENHEIM, München. med. Wchnschr. **73**:818, 1926.

Parathyroid extract — Collip proved of benefit in a case of idiopathic tetany in a boy, aged 3½, who behaved like an animal without parathyroids.

THE TREATMENT AND PROGNOSIS IN ACUTE AND CHRONIC EPIDEMIC ENCEPHALITIS. MEINICKE, München. med. Wchnschr. **73**:1647, 1926.

The author feels that treatment with the reconvalescence serum is the only reliable form of treatment in the acute form of epidemic encephalitis. The chronic cases also can be influenced, although the result is not so good. From the point of view of prognosis, the cases of pseudopsychopathic disturbances in children are the most favorable, but treatment for periods of years is needed. Therapy and curative pedagogy should be in the hands of specialists.

THE LACTIC ACID CONTENT OF THE CEREBROSPINAL FLUID. RUDOLF SCHELLER, München. med. Wchnschr. **73**:1652, 1926.

Normal cerebrospinal fluid contains from 9 to 15 mg. per cent of lactic acid. The amount corresponds to the amount in the blood. In cases of meningitis and tumors of the meninges, sugar that has disappeared can be recovered quantitatively as lactic acid. The glycolysis is brought about by bacteria, pus cells and tumor cells.

THE PSYCHIC IN PEDIATRICS. FRANZ HAMBURGER, München. med. Wchnschr. **73**:1965, 1926.

Agreeable and disagreeable sensations, that is, joy, hope, confidence, sorrow, fear, distrust, and similar emotions act on every cell of the child, so to speak. The author cites some examples in which various ailments disappeared readily following suggestive therapy. Much of the paper is difficult to abstract and the original may be read with more or less benefit.

AMBERG, Rochester, Minn.

TETANY AND ALKALOSIS. J. HOLLÓ and ST. WEISS, Wien. klin. Wchnschr. **39**:1422 (Dec. 2) 1926.

The authors claim that attacks of tetany may be produced in healthy men by hyperventilation, i. e., rapid forced breathing for from five to ten minutes. In four experiments in which this method was used, they demonstrated a displacement of the blood p_H toward the alkaline side, the increases varying from 0.09 to 0.17. The bicarbonate content of the blood decreased to as low as 10 volumes per cent. Calcium administered intravenously and by mouth and ammonium phosphate given by mouth rendered the blood p_H of healthy men slightly more acid. Sodium bicarbonate (from 20 to 40 cc. of a normal solution intravenously) caused only a slight elevation of blood p_H, and in only one case was a tetanic attack produced. The authors observed alkaline p_H values in the bloods of patients having exophthalmic goiter, pernicious anemia, carcinoma, and cirrhosis of the liver; in only one of these patients, a man with pyloric carcinoma and achlorhydria, was tetany seen. The blood p_H was 7.84. In eight cases of latent and manifest tetany in infants and children, the blood p_H values, with a sole exception, were within normal limits. The exception was an infant who had latent tetany and a blood p_H of 7.66; a month later during a severe attack of tetany the p_H had increased to 7.74. The plasma bicarbonate was 64.5 volumes per cent during the attack.

The authors conclude that, although an alkaline blood reaction acts tetanogenically, individual degrees of susceptibility to tetany and factors in its causation, which are at present unknown, exist.

OLMSTED, Seattle.

SYSTEMATIC STATEMENT AND CLINICAL CONDITIONS IN MENINGO-ENCEPHALITIS IN CHILDREN. J. BROCK, Ztschr. f. Kinderh. **40**:552, 1925.

Because in many cases of meningo-encephalitis the picture is incomplete, due to the inability to correlate observations in the spinal fluid with pathologic conditions in the brain, especially in those patients who recover, in the present condition of our knowledge it would be more practical to report thus: bronchopneumonia, with severe meningo-encephalitis (spinal fluid without observations) or, severe diarrhea, with mild meningo-encephalitis (increased amount of spinal fluid). Neither a simple meningismus nor a meningo-encephalitis can surely be diagnosed. What is needed are more cases with an accurate report of the spinal fluid, taken just before death, and the observations of the central nervous system.

Brock reports several cases of purulent meningitis: 1. Pertussis, in which meningitis was not revealed until necropsy, in spite of examination of the fluid. 2. Tuberculous meningitis with an extraordinary number of pus cells. 3. Purpura rheumatica with an aseptic purulent meningitis. 4. A case caused by *Bacillus enteritidis-Gärtner;* no other similar case has been reported.

Cases of true encephalitis may be accompanied by symptoms indicating meningo-encephalitis, and may be suspected when drowsiness increases and stiff neck and the Kernig sign diminish. The spinal fluid, in contrast to that of tuberculous meningitis, will show a normal or increased sugar content.

Two cases of encephalitis following measles are reported, one of them with necropsy showing acute focal destruction of myelin in the sheath, of relatively good axis cylinders and glial reaction.

EMERSON, Boston.

CEREBELLAR CYSTS. ARVID LINDAU, Acta path. et microbiol. Scandinav., suppl. 1, 1926, pp. 1-128.

More than 275 instances of cerebellar cysts have been described, and they form about 10 per cent of all cerebellar tumors. The report concerns either simple cysts or, more commonly, cysts in connection with capillary angiomas or gliomas. The angiomas are small, well defined, cortical or subcortical, mostly in the lateral or posterior parts of the cerebellum; microscopically, the picture is that of a hyperplastic, capillary angioma with pseudoxanthoma cells, small giant cells and a plasmatic transudate. Sixteen new cases are added to the twenty-four found in the literature. Four such tumors have been observed in the medulla. The gliomas vary in size; they are mostly dorsal or medial in situation; the cyst wall consists of glia tissue and, except in certain special cases, it has no ependymal lining. In angiomatosis of the retina (v. Hippel's disease) cerebellar cysts or angiomas in the cerebellum or medulla occur in about one fifth of the cases. Lindau describes one case of retinal angioma with a cerebellar cyst and angioma. In connection with angioma of the medulla and cord, cystic spaces may form that resemble syringomyelia. Lindau also discusses some fifteen cases, nine of which were observed by himself, of angiomatosis of the retina, rhombencephalon and cord; in eight of the cases a cystic pancreas was present, in ten there were cysts in the kidneys and in six there were hypernephromas. All these formations may be referred to disturbances

of development in the mesoderm at about the third embryonal month. Angiomatosis of the central nervous system belongs in the same group as tuberous sclerosis. Cysts connected with the fourth ventricle probably develop from preformed cavities. The genesis of simple cerebellar cysts is not clear; in cysts connected with an angioma or a glioma, the angioma or glioma is primary. At operation the cyst wall, as well as the tumor proper, if present, should be removed whenever possible.

[ARCH. PATH.]

Diseases of the Ear, Nose and Throat

GLYCEMIA IN ACUTE AND CHRONIC DISEASES OF THE TONSILS. ANTONIO GALLO, Arch. internat. de laryngol. otol. rhinol., p. 917.

Professor Vattunone is quoted as saying that a mechanical irritation of the tonsils causes an increase in the blood sugar. He believes that the tonsils secrete a hormone which influences the formation of blood sugar. His experiments were carried out on animals and were not verified clinically.

Various researches were made by Scheier, Pugnat, Rossi, Marcelli, Caldera, Brunette and Comel. Their conclusions were that during a pharyngotonsillitis there is a transitory glycosuria; this glycosuria may be produced by irritation of the tonsils; extracts of bovine tonsils, properly prepared, possess a more or less glycolytic action; extracts of bovine tonsils markedly influence the glycosuric action of the suprarenals; the glycolytic action is more marked when the extract is injected intravenously.

The blood sugar was estimated according to the method of Cruto. The clinical researches were divided into two groups: The first was concerned with the blood sugar in acute and chronic tonsillar conditions and the second with blood sugar before and after operation.

The author comes to the conclusion that the acute infections in the first group are dependent on the parasympathetic system, favoring the intrahepatic glycogen or dependent on the sugar content received by way of the portal vein, which in turn stimulates the internal secretion of the pancreas. The trauma of operation in the second group increases the thrombokinase, causing a stimulation of the suprarenals and hypophysis, with a subsequent increase in the blood sugar.

ROTH, Kankakee, Ill.

THE SIGNIFICANCE OF CHRONIC TONSILLITIS IN CHRONIC NEPHRITIS. WICHERT, München. med. Wchnschr. **73**:1926, 1926.

Although the number of cases studied is relatively small, there seems to be a close connection in many between chronic tonsillitis and chronic inflammatory renal disorders. In such cases tonsillectomy produces benefit.

TECHNIC OF TONSILLECTOMY IN CHILDREN. PAUL OHNACKER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **16**:420 (Oct. 1) 1926.

The dangers of a general anesthetic can be avoided if all precautions are observed. Well trained assistance is necessary in tonsillectomy performed either with the patient in the sitting position or by using a kind of suspension laryngoscopy. Complete extracapsular enucleation can be obtained also in other ways. In the clinic in Magdeburg, more than a thousand tonsils have been removed, according to Sluder. The tonsillectome works best if it is not too sharp or too dull. When ethylchloride anesthesia is used with the

drop method, the Whitehead mouth speculum is introduced. Sluder's tonsillectome, over which a Bruening sling has been placed, is introduced according to the rule of the author, and the tonsil is pressed through the opening. Then the blade is pushed forward. The moment that the capsule is seen, Sluder's tonsillectome has done its duty as a cutting and separating instrument. The tongue depressor can be laid aside. The enucleation of the tonsil is quickly but carefully performed with the finger (a rubber glove is used and over it a cloth glove). As the capsule is exposed, the right layer cannot be missed. Extracapsular enucleation is easy, because the closed Sluder tonsillectome holds the tonsil and keeps the connection with the base stretched. Fixation and stretching is important. Severing of the palatine arch along its anterior border does not have any disadvantages; on the contrary, it is advantageous because it allows a good view. The plica supratonsillaris is severed and the supratonsillar fossa is opened. The upper pole is made accessible. Sometimes the severing of the palatine arch cannot be avoided. Sluder himself states that a small part of the anterior palatine arch — a few fibers of the palatoglossal muscle — can be seen in the removed specimen. The author asserts that his method is superior when using general anesthesia, which is necessary in children, on account of the rapidity and simplicity of performance.

CHANGE OF VOICE IN BOTH SEXES. H. L. FELLENZ, Ztschr. f. Hals-, Nasen- u. Ohrenh. **16**:426 (Oct. 14) 1926.

Change of the voice is usually known as breaking of the voice. Other forms are rarely considered. The different variations are of importance for later life. Change of voice in the female sex is almost unknown, and is not considered in vocal lessons. In the meridian of Munich, change of voice in boys usually occurs between the ages of 14 and 16 years, with the beginning of puberty. The change may be completed in the fourteenth year (Weinberg) and may begin in the eleventh and twelfth years (Nadoleczny), and it can be delayed until the twenty-first year (Gutzmann). The duration of the period of change of voice may be from a few months to several years. Extensive investigations concerning this change in voice in girls have not yet been made. The change seems to begin earlier in them — from the twelfth to the fourteenth year.

The physiologic process consists of lowering of the pitch on account of the growth of the larynx during sexual development. In the male, the length of the vocal cords increases about one-third, and the voice becomes one octave lower, whereas the higher tones can be produced only with the head voice or not at all. In the female, the growth of the larynx is considerably less; the voice is lowered about a third; therefore the change is more easily unobserved.

The falsetto voice is produced when the musculus vocalis suddenly ceases to function and the musculus externus controls the voice. This does not necessarily occur. It happens in only 17 per cent of the girls (Makenzie). In 40 per cent of the patients singing is impossible until the fifteenth year. The rough voice is more frequent in the female sex. The vocal cords act as in paresis of the musculus internus. There may be a slight redness of the epiglottis and the vocal cord; it may be absent (in about 10 per cent) or be combined with pronounced edematous swelling (in about 15 per cent). Usually the mucous membrane is more or less succulent and the secretion is increased.

The author gives case histories: The girls examined complained of difficulty in singing or talking. In all cases, rest and care of the voice are of the greatest importance. Frequently, treatment is necessary to teach the subject how to use the upper chest tones and the middle register of the voice; later, the entire

range of the voice may be used, but the high tones may be used only moderately. A number of histories of male patients are given in whom the falsetto voice persisted. The closure of the vocal cords as a rule is imperfect or completely absent at the posterior third. Treatment consists of voice exercises to accustom the patient to the lower pitch of the voice. Moderate galvanization or faradization or vibration with tuning forks is recommended. The treatment lasts for from eight days to several months.

The pitch is higher than the normal pitch for the male voice (*A-d*), and is usually within the range of the female speaking voice (a-d^1) or higher. The chest voice is frequently absent. Treatment tends to accustom the subject to the deep register. This treatment can be made more effective by pressure toward the back on the thyroid cartilage, and moderate use of the pulsating constant current (Flatau) or the faradic current (Imhofer), or vibration with tuning forks (Maljutin and Gutzmann). The patient must take reading and speaking exercises. Fellenz reports thirty-two cases. Case 29 may be mentioned. A woman, aged 20, surprisingly small for her age — she looked as if she were 16 years old — for five or six years, about since the time of puberty, had complained of hoarseness and hawking. There was not any particular pathologic condition of the upper air passages. The vocal cords were short, of medium width and succulent. The veins of the cords were somewhat enlarged; the borders were a little reddened. The patient's voice reached the pitch *a*, whereas, while reading, it reached c^1 sharp, d^1. The patient hawked with each sentence. The chest voice was from *f* to e^1, the middle register of the voice from f^1 to d^1, the head voice reached e^2, f^2 sharp, respectively g^2. The patient had a weak voice and increased secretion. After treatment with insufflations of anesthesin for four weeks, the mucus disappeared from the larynx. The patient had not been allowed to sing or exert her voice. She hawked then only rarely. Fellenz discusses many phases of this subject, of which only a few more can be mentioned here. Hidden disturbances of the change of voice are almost as common in the female as in the male, and treatment is perhaps more tedious. A falsetto voice is rarely present.

Treatment with caustics or the brush could have been avoided frequently if the voice had been tested. Therefore, in cases of continued hoarseness, the voice should be tested as a routine measure. On the other hand, not each coarse and hoarse voice is caused by functional disturbance. The larynx must also be examined from the outside and with the mirror; otherwise tuberculosis of the larynx might be overlooked. Teachers of the technic of breathing and voice formation for months have "treated" patients, who suffered from tuberculosis of the larynx by exercises of the voice, whereas silence should have been prescribed.

It is important to recognize the disease of the voice mentioned, because children and servants who are chronically hoarse may be suspected of suffering from tuberculosis, and teachers who are suspected of having this disease may be dismissed. Sometimes during the change of voice in the male there is retarded growth of the larynx. The voice cannot be formed in the deep register because this is anatomically impossible. In the female, an unusual change of voice is shown by an abnormally deep voice. Usually an abnormally large larynx is present. Zumsteeg described a base voice in a female vaudeville singer. Scheier reported a base voice in a girl aged 16; it turned into a falsetto voice. Herzog described a case of heterologous pubertas praecox in a girl aged 3 years, whose range of voice was determined by Nadolezny to be between G sharp and G.

AMBERG, Detroit.

Diseases of the Skin

EXPERIMENTAL STUDIES IN ECZEMA. JOSEPH V. KLAUDER and HERMAN BROWN, Arch. Dermat. & Syph. **15**:1 (Jan.) 1927.

In a study of the content of calcium, magnesium, sodium and potassium in rabbit skin in relation to cutaneous irritability as judged by applications of croton oil, there appeared to be an inverse relation between irritability of the skin and calcium content and a direct relation in regard to potassium. The greater the irritability of the skin, the greater the likelihood of a low calcium content and a high potassium content. Calcium, particularly when administered intravenously, is valuable in the treatment of eczema.

JEANS, Iowa City.

SOME HISTORICAL AND CLINICAL REMARKS ON THE EFFECT OF LIGHT ON THE SKIN AND SKIN DISEASE. C. RASCH, Proc. Roy. Soc. Med. **20**:11 (Nov.) 1926.

Some of the earliest recorded experiments on the action of sunlight on the skin were performed by an English physician, Sir Everard Home (1763-1832). By covering part of the dorsal surfaces of the hands with cloth and recording the temperature beneath it and on the open surface, he found that on exposure to sunlight the temperature beneath the cloth was higher but that a dermatitis occurred on the uncovered portion, thus indicating the action of an actinic ray rather than heat. He further demonstrated the comparative resistance of pigmented skin to sunlight. Brief reference is made to other early contributions on the subject. Wilson (1798) first described a disease due to sunlight under the name of eczema solare. Xeroderma pigmentosum was described by Kaposi in 1870, but he did not at this time ascribe it to the action of sunlight. In 1878, Hutchinson described prurigo aestivalis. In 1906-1907, Dubreuilh stated that most of the epitheliomas of the face, together with the common so-called senile alterations of the skin, are produced by sunlight. In 1911, J. H. Sequeira described "permanent freckles," and in 1917, Riehl described the so-called war melanosis, the almost black pigmentation called forth by light. Bazin's hydroa and transitional types are mentioned. The author records 231 cases of hereditary light eruptions in 31,000 dermatologic cases in Denmark between 1911 and 1925. These included examples of polymorphous light eruptions (Rasch), hydroa vacciniformis (Bazin) and a special syndrome first described by Prof. T. McCall Anderson of Glasgow comprising porphyrinuria (congenital), large blebs with resulting ulceration and destruction of the nose and ears and lesions of the hands resembling sclerodactylia. Two cases each of xeroderma pigmentosum and Riehl's melanosis were seen and a histologic resemblance of the latter to lichen planus noted. Colloid milium and chronic dermatitis of the neck due to sunlight were seen as were also pigmented spots, achromic spots, atrophic macules, keratoses and epitheliomas due to light. It is recorded that smallpox will heal without scars if the patient is kept in the dark. Attention is directed to a group of diseases aggravated by light, such as rosacea and lupus erythematosus; acne vulgaris, secondary syphilitic eruptions, elephantiasis and lichen planus are mentioned as examples of conditions favorably affected by light. Thirteen illustrations and an extensive bibliography accompany the article.

GUY, Pittsburgh.

EXPERIMENTAL RESEARCHES ON THE ACTION OF SHORT-WAVE ULTRARED RAYS ON THE SKIN. W. JADASSOHN, Arch. f. Dermat. u. Syph. **152**:113 (Nov. 13) 1926.

Jadassohn made about twenty irradiations of normal human skin, treating a field 8 cm. in diameter in each case. When the intensity of the rays is slight and the time of irradiation brief, the reaction, consisting of an immediate erythema, extending beyond the field irradiated, disappears within the first hour, leaving a red spot corresponding exactly to the area treated. This spot also vanishes in from three to five hours. Sensibility is normal. When the intensity of the rays is greater and the time longer, a wheal, the size of the irradiated field, appears within a few minutes in the center of an area of erythema. Within the first hour the wheal develops into a blister, and the redness disappears. In the course of a few days the blister either breaks or dries up, and a small ulcer, covered with a crust, appears. This ulcer heals very slowly. Pain is absent throughout the course of the reaction. There is hyposensibility of the irradiated area. Microscopic studies were made at various periods of the reaction. An effect on the deeper tissues was not noted until several days after the irradiations. Investigations are being made on the action of ultrared rays on pathologic tissues.

ZAPFFE, Chicago.

VARICELLA ZOSTER (BOKAY). E LAUDA and D. STOHR, Monatschr. f. Kinderh. **34**:97, 1926.

In order to determine whether varicella and herpes zoster were due to the same virus, the authors inoculated fifty-four children with the vesicle contents of seventeen cases of herpes zoster. The technic was that of cutaneous vaccination. They did not observe any specific local reaction as had been described by Kundratitz. This may have been due to the fact that in the Kundratitz experiments the herpes occurred in children while in these cases the herpes occurred in adults. Three of the inoculated children developed varicella in from fourteen to eighteen days after the vaccination. As far as is known, the three children were not exposed to chickenpox and could have developed the disease only from the inoculation.

In three cases children who had not been inoculated but who had been in contact with the herpes cases developed varicella. The disease appeared after the proper incubation time and presumably was contracted by exposure to the herpes cases. Such observations cast doubt on the conclusion that the three children developing varicella following inoculation were infected by the inoculation. They were exposed to the disease in the ward as were the other three who were not inoculated.

Attempts to prevent varicella by prophylactic injections of convalescent herpes zoster serum gave negative results.

The observers conclude that their experiments do not entirely favor the conclusion that varicella and herpes zoster are due to an identical virus.

GERSTLEY, Chicago.

EPILATION IN CASES OF FUNGUS DISEASE OF THE HAIR BY THALLIUM. A. BUSCHKE, ERICH LANGER and L. SCHAYER. München. med. Wchnschr. **73**:815, 1926.

In twelve children, from 1 to 10 years of age, thallium acetate dissolved in sugar water in doses of from 6 to 8 mg. to each kilogram of body weight accomplished epilation of the hair without harm. The authors never have seen

even transitory albuminuria, headache or pain in the limbs. Naturally, after the epilation the fungus diseases has to be treated. Epilation now has been accomplished in more than 600 children, all with mycotic disease of the hair. The results certainly are as good as those following roentgenotherapy, which more easily produces transitory or lasting injuries.

FURTHER OBSERVATIONS ON THE TREATMENT OF THE SKIN MANIFESTATIONS IN EXUDATIVE DIATHESIS. A. S. SOKOLOW, München. med. Wchnschr. **73**:945, 1926.

In nearly all cases of prurigo and urticaria, subcutaneous injections of milk gave good results.

A CASE OF FEER'S DISEASE. ALOIS BRATUSCH-MARRAIN, München. med. Wchnschr. **73**:1114, 1926.

Feer described a peculiar picture of disease due to a functional disturbance of the vegetative nervous system (acrodynia). The author reports a case in a child, aged 11 months, with emaciation, diminished muscle tonus, increased reflexes, rather rapid pulse, and a peculiar puffiness of the hands and feet, which appeared increased in size, the skin being slightly reddened and sometimes cyanotic. The child withstood an attack of bronchial pneumonia but had attacks of transitory fever all the time. Even in periods without higher temperature, the temperature was somewhat raised. During convalescence a blister developed on the great toe. The only difference between this case and those described by Feer lies in the rise of temperature.

AMBERG, Rochester, Minn.

THE ETIOLOGY OF ERYTHEMA NODOSUM. H. KOCH, Ztschr. f. Kinderh. **40**:584, 1925.

The question, "Is erythema nodosum a rheumatic disease?" is answered in the negative. There are differences epidemiologically; the course of the annual incidence of rheumatic fever is almost a straight line; that of erythema nodosum shows a marked peak in winter, similar to that of tuberculosis. The clinical symptoms are different; in one case the joints show swelling, and in the other the diaphyses. Pain in the former is due to inflammation of the joints, of the latter to inflammation of the periosteum. In erythema nodosum there are no complications as there are with rheumatic fever, such as chorea and endocarditis. Certainly in the United States, these differences do not all hold.

EMERSON, Boston.

Surgery and Orthopedics

ENDOTHELIAL MYELOMA, EWING. CHARLES L. CONNOR, Arch. Surg. **12**:789, 1926.

Sixty-seven cases of Ewing's tumor, in this paper designated endothelial myeloma, have been recorded in the Registry of Bone Sarcoma of the American College of Surgeons. This constitutes about 10 per cent of all the bone tumors registered, and they are considered important enough clinically and pathologically for report in full. The belief that these form an entity separable from osteogenic sarcoma is borne out by the characteristics here emphasized; namely, their almost constant location in the shafts of the long bones and in flat bones in which osteogenic sarcoma seldom occurs, their peculiar morphology, the type of cell being easily distinguished from the osteoblast in most cases, and their

susceptibility to radium and roentgen-ray treatment. The cells do not form an intercellular substance that will stain with the dyes used to differentiate collagen, bone and cartilage. At the same time the cells are separable from those arising from the primitive hemocytoblast, and are considered therefore to be different from other various forms of myeloma which presumably arise from that cell. They resemble other myelomas by their predilection to metastasize to other bones.

They occur in children mainly, and many of them are preceded by trauma and by signs of inflammation, apparently resulting from the trauma, this inflammation reaction passing so imperceptibly into malignant disease that the two seem inextricably associated in the early stage.

Histologically, they may be divided into angiomatous, reticular and diffuse, the first perhaps somewhat less malignant, being furthest differentiated, the last the most malignant. The reticular type is considered the parent type, the other two being variations of this caused by location and differences in rate of growth. Several tumors studied were seen to arise apparently from the reticulum of the bone; this observation, with the evidence presented concerning the embryologic development of the reticular cell from a primitive mesenchyme cell, seems to indicate that the origin is in the cells of the reticulo-endothelium of the bone marrow. Because it is desired to express this origin in the name, the tumor has been called endothelia myeloma, thus sharply distinguishing it from all other bone and bone marrow tumors.

Several important characteristics almost constantly associated with the tumor are the slow development with intermittent pain, swelling that may recede only to return and to become progressive and the distressingly frequent confusion with chronic osteomyelitis clinically, roentgenologically and even occasionally histologically. But diagnosis is possible in most cases by correlation of the history and physical signs with a rather typical roentgenographic picture. As a final distinguishing point, the therapeutic radium or roentgen-ray test is advocated, this tumor, in contrast to osteogenic sarcoma, usually melting away, under the influence of these forces.

Contrary to the opinions of Ewing and others, it is thought that endothelial myeloma arises as a solitary tumor, the multiple tumors appearing as actual metastases, and for this reason it is believed that amputation in the early stage is a form of treatment to be considered, though cure has been obtained in several cases, apparently, by radium.

The prognosis, with a combination of surgery and irradiation, is not always death. Patients have lived for five years or longer (one for sixteen years) after amputation, and many who have been treated by a combination of surgery, radium, the roentgen ray and Coley's toxins, are living more than three years after the onset of the disease. The prognosis seems distinctly better than that of osteogenic sarcoma and other myelomas, and for this reason it is urged that these be considered special cases in which, by energetic measures, a permanent cure may be possible.

AUTHOR'S SUMMARY.

NON-TUBERCULOUS HIPS IN CHILDREN SIMULATING TUBERCULOSIS. C. B. FRANCISCO, J. Missouri State M. A. **23**:385, 1926.

Any physician may be called on to express an opinion as to the cause of lameness in a child in whom the hip is involved. Up to 1909, when changes in a joint were not observed by the roentgen ray and when rheumatism was

not present, it was said to be due to tuberculosis. Legg-Calve-Perthes hip (osteochondritis deformans coxae juvenilis) is a nontuberculous condition in which the ephiphysis is flattened, its ossifying center distorted and the head sequestered; the neck of the femur is broader and shorter than normal and the angle lessened. It occurs in children under 5 years of age.

Francisco reports five cases in children under 10 years of age. Here, however, the roentgenograms were characterized by rarefication of the head and neck of the femur, not unlike an early tuberculous process. Muscle spasm and constitutional symptoms were not present. In all cases the density of the bone returned. Francisco treated the hips by relieving them from any weight bearing. He believes that the cases are developmental and result from mechanical cause and that the roentgenograms are different because the cases occur in children older than those in whom the disease usually is observed.

THE TREATMENT OF TUBERCULOSIS OF THE HIP. J. ALBERT KEY, J. Missouri M. A. **23**:388, 1926.

As there is a wide difference of opinion as to what is the ideal treatment, there is no standard method. The author, therefore, deals not with what should be done but with what can be done. He describes the natural course of the disease with its deformity, persistence of living tubercle bacilli and secondary infections. When the treatment is conservative and heliography is used, the stay in the hospital is close to four years. Key believes that it is far better when the diagnosis is established to secure the best bony ankylosis in adults, adolescents and older children by arthrodesis. In younger children the treatment must be conservative, the deformity corrected, by traction, heliotherapy, a high caloric diet and general hygiene.

SCHORER, Kansas City, Mo.

CONGENITAL GENU RECURVATUM WITH REPORT OF A CASE. SAMUEL W. BOORSTEIN, M. J. & Rec. **124**:541 (Nov. 3) 1926.

Genu recurvatum is an anterior displacement of the tibia. The leg is hyperextended on the thigh. The condition is considered the result of abnormal and fixed position in the uterus. It is therefore mechanical in nature. The patella is usually rudimentary. This condition is amenable to treatment, which should be commenced immediately after birth. A small Thomas Jones splint can be used to keep the limb in the proper position. Massage and exercises can be used easily with this brace. The author reports a case in a child only 3 days old.

WILLIAMSON, New Orleans.

ADHESIONS OF THE PERICARDIUM AND CARDIOLYSIS IN CHILDREN. WALTER SCHAEFER, Jahrb. f. Kinderh. **60**:127 (Oct.) 1925.

Pericarditis is particularly common between the ages of 7 and 10 years. One third of the cases of rheumatism in children are complicated by pericarditis, while in adults only about one tenth of the cases show this complication. According to Heubner, 50 per cent of children having pericarditis develop adhesive pericarditis.

Medical treatment with rest in bed, and the administration of digitalis, theobromine sodiosalicylate and fibrolysis have improved but have not cured the patients; most of them have a bad prognosis and die before puberty.

The cardiolysis of Brauer or what Kocher calls thoracolysis praecardiaca consists of a subpenostial resection of the fourth, fifth and sixth ribs from the left border of the sternum to the mammillary line, thus giving the heart a fuller play. It is indicated only when systole is interfered with but is of little value when the diastole is interfered with. Of course in most cases both systole and diastole are interfered with.

The author reports one patient who was alive nine years after operation and four other patients whom he was not able to follow so well and whose convalescence was not so rapid as in the first case. One of these four patients died one and one-fourth years after operation. Difficulties arise because of regrowth of bone, as it is impossible to remove all of the posterior layer of the periosteum. Some of the good results no doubt are due to resorption of the adhesion as a result of the increased cardiac movement.

E. W. EHRMANN, Chicago

TRAUMATIC PERFORATION OF HEALTHY APPENDIX. R. GUTZEIT, Zentralbl. f. Chir. **53**:1943, 1926.

A kick by a horse caused rupture of the appendix in a boy, aged 14 years. This was the only intestinal injury. Symptoms of peritonitis set in immediately. An operation was performed and recovery ensued.

[ARCH. PATH.]

Miscellaneous

KEROSENE POISONING. ORVILLE BARLOW, J. A. M. A. **87**:488 (Aug. 14) 1926.

A white boy, aged 15 months, who had drunk a portion of 6 ounces (178 cc.) of kerosene six hours before, was in a comatose state when first seen. Respirations were rapid and shallow; the pulse was 160 and feeble; the temperature was 101.6 F.; the skin had a pinkish hue, and the lips were cherry red. The urine spectrum was negative for methemaglobin, while the blood spectrum was positive. The clinical picture of this condition is similar to that produced by illuminating gas. In severe cases, bleeding with subsequent transfusion would seem to be indicated.

BONAR, Salt Lake City.

CAUSES UNDERLYING SEX DELINQUENCY IN YOUNG GIRLS. MABEL SEAGRAVE, J. Soc. Hyg. **12**:523 (Dec.) 1926.

In a review of several studies based on this problem, including the author's own statistics, it would appear that, in most cases, neither physical nor mental inferiority can be ascribed as an adequate explanation for delinquency. On the other hand, unfortunate conditions at home have a definite influence. Nationality might be a factor, but it is probable that the high percentage of foreign stock observed in this connection would be less obvious if American parents brought their problems to agencies, rather than adjusted them without assistance. The undermining of moral codes, with lack of idealism, together with a false sense of security from unfortunate sequelae, has done much to foster delinquency. The author believes that the present laxness will probably lead to a sense of reaction, with resultant effort to eradicate places of social depravity. She questions whether this will be adequate, without also the development of a sense of idealism.

BOYD, Iowa City.

Society Transactions

CENTRAL STATES PEDIATRIC SOCIETY

Joint program presented by pediatric groups from St. Louis, Kansas City, Iowa City and Memphis, held at St. Louis, Oct. 22 and 23, 1926

Program for Friday Morning, Oct. 22, 1926

In Memoriam, George Marvine Tuttle. Dr. A. S. Bleyer.

Epidemic Meningitis: Injection of Serum by Multiple Routes. Dr. Frank C. Neff, Kansas City.

Congenital Umbilical Hernia of Liver and Stomach. Dr. Frank C. Neff, Kansas City.

Ectopia Cordis and Cleft Sternum. Dr. Frank C. Neff, Kansas City.

SYMPOSIUM ON OTOLARYNGOLOGICAL CONDITIONS IN CHILDREN

A Brief Résumé of Five Years Study of Paranasal Sinus Disease in Children. Dr. E. C. Mitchell, Memphis.

Vasomotor Nasal Disturbances in Children. Dr. French K. Hansel.

Sinus Disease in Children. Dr. M. F. Arbuckle.

Mastoiditis in Infants. Dr. A. M. Alden.

Hidden Mastoiditis. Dr. P. C. Jeans, Iowa City.

SYMPOSIUM ON SYPHILIS

Neurosyphilis. Dr. J. V. Cooke.

Experiences with Sulpharsphenamine. Dr. M. L. Floyd, Iowa City.

Clinic on Neurosyphilis. Dr. Paul J. Zentay.

Congenital Motor Instability of the Choreiform Type. Dr. Paul J. Zentay.

Acute Abdominal Symptoms in the Course of Diabetes. Dr. A. F. Hartmann.

Comparison of the Acid Base Equilibrium of the Blood in Infants Fed on Sweet and Sour Cow's Milk. Dr. Dan C. Darrow.

Methods of Lung Mapping. Dr. J. J. Singer.

Roentgen-Ray Studies of the Colon in Children. Dr. J. W. Larimore.

Diseases Benefited by Splenectomy. Dr. M. B. Clopton and Dr. McKim Marriott.

EPIDEMIC MENINGITIS: INJECTION OF SERUM BY MULTIPLE ROUTES. DR. FRANK C. NEFF.

Two cases of meningococcus meningitis occurring in the same family were reported. The older child was 6 years of age and the younger 3 months. Treatment consisted of the intraspinal, intramuscular and intravenous injection of antimeningococcus serum each day during the febrile course of the disease. Recovery was prompt, and there were no untoward results from the treatment except a single reaction following intravenous administration. The symptoms in this case were promptly relieved by epinephrine given subcutaneously.

CONGENITAL UMBILICAL HERNIA OF LIVER AND STOMACH. DR. FRANK C. NEFF.

A full-term, female infant at the time of delivery was found to have an umbilical mass 3 inches in diameter, covered only with a shiny, transparent membrane. The hernia was bluish red. The infant was operated on at the age of 36 hours by Dr. Lawrence Engel. The hernia contents were found to be liver, spleen, the greater curvature of the stomach and some small intestine. The postoperative course was mild, only slight fever and no symptoms referable to the abdomen being present. The blood bicarbonate was 18 volumes per cent, and the nonprotein nitrogen 58.8 mg. per hundred cubic centimeters following operation. At the age of 5 months the child was well developed and had normal abdominal functions, as shown in figure 1.

Fig. 1

Fig. 2

Fig. 1.—Appearance of infant, at 5 months, after operation for congenital umbilical hernia of liver and stomach.

Fig. 2.—One of twins, showing ectopia cordis and cleft sternum.

ECTOPIA CORDIS AND CLEFT STERNUM. DR. FRANK C. NEFF.

Three cases of ectopia cordis associated with cleft sternum have been seen in Kansas City during the last year. One of these was reported. The infant was one of twins (fig. 2), the other being a monster without gross human characteristics. The infant lived twenty-eight hours. The heart was entirely extrathoracic. The sternum was almost entirely absent, the defect being covered partly by pericardium and diaphragm and partly by integument and muscle. The heart consisted of only three chambers, a single auricle and two ventricles. The latter communicated through a patent septum. The case was similar to those discussed by David Greig in the *Edinburgh Medical Journal*, August, 1926.

A BRIEF RÉSUMÉ OF FIVE YEARS STUDY OF PARANASAL SINUS DISEASE IN CHILDREN. DR. E. C. MITCHELL.

During this period 349 patients, in whom paranasal sinus disease was suspected, were examined. In this series, 120 cases of ethmoid sinus infection, 115 cases of maxillary sinus infection and one infection of the sphenoid sinus

were found. The conditions for which these examinations were made were as follows: anemia, five; cyclic vomiting, nine; arthritis, ten; chorea, twenty-three; functional heart, twelve; endocarditis, six; fever undetermined, thirteen; headaches, five; incipient tuberculosis, one; pulmonary tuberculosis, two; asthma, twenty-two; recurrent colds, forty-one; persistent coughs, nine; infections of the urinary tract, 164; diabetes, one; loss of appetite and failure to gain, twenty-three, and recurrent bronchitis, fourteen. In addition, in order to familiarize ourselves with the normal sinuses at the various ages, 200 roentgenograms were made of children varying in age from birth to past puberty. The following conclusions were drawn from this study:

1. The roentgenograms showed a definite ethmoid, maxillary and sphenoid sinus from birth. In the normal child the frontal sinus began to appear at 2 years of age and increased in size up to and past puberty. One of the chief values of the roentgenogram was that it helped to determine the anatomy of the individual case, as there was considerable variation in both size and contour of the sinuses of children of the same age.

2. In those cases showing paranasal sinus infection, the frontal sinus was often rudimentary or absent. From the present study I am inclined to believe that development of the frontal sinus stopped at the time the disease was well established and began to develop again only after the disease was eradicated.

3. The age incidence showed the greatest number of infections to occur in the fifth, sixth and seventh years of life. Seasonal incidence showed the greatest number of infections to occur in March and September and few if any in the summer months.

4. By far the larger number of cases occurred after the tonsils and adenoids had been removed, the history seeming to indicate temporary improvement following operation with later relapse.

5. Surgical treatment consisted of antrumotomy, with a small tube left in situation for drainage with daily washings for a period of five days. Sixty-four patients were treated surgically; thirty-eight were cured, sixteen improved, eight unimproved, and two could not be accounted for.

6. Medical treatment consisted of irrigation and other local treatment by the rhinologist, ultraviolet ray, cod liver oil and calcium and supervision of the diet. One hundred and fifty-four of the patients were treated medically; seventeen were cured, seventy-four improved, forty-two unimproved, and twenty could not be accounted for.

7. A patient was considered cured only after he had been followed for two years with no return of symptoms, either general or local, during this period. Roentgenograms were made first at one month, and then at six month intervals. These showed both a clearer shadow and some degree of return to normal in the development of the frontal sinuses.

8. This study indicated that conservative sinus surgery was more beneficial than medical treatment in this series of cases.

VASOMOTOR NASAL DISTURBANCES IN CHILDREN. DR. FRENCH K. HANSEL.

Vasomotor nasal disturbances, including hay-fever, asthma, and hyperesthetic rhinitis, are more common in children than is generally believed. In these cases an erroneous diagnosis of recurrent acute rhinitis or sinusitis is often made. The family history is important, a similar condition having been present in one or both parents in almost 60 per cent of the cases. The cardinal symptoms are sneezing, nasal obstruction and nasal discharge. The nasal discharge does not become purulent, and there is no accompanying fever.

There are definite changes in the nasomucous membrane consisting of a hyperplasia of the epithelium and an increase in the number of goblet cells. This leads to a gray discoloration. In cases of long standing an atrophic process replaces the hyperplasia. The hyperplasia is uniformly distributed and is not confined to the region of the ostea, as in the case of sinus infections. Roentgenograms of the accessory sinuses frequently show cloudiness, which is apparently due to a thickening of the lining membrane. Secondary infection of the mucous membrane in the sinuses may occur and complicate the picture. Treatment is based on the elimination of the offending protein or desensitization. Palliative local treatment by means of sprays may be used, but surgical procedures in the nose should be discouraged in true vasomotor cases.

Sinus Disease in Children. Dr. M. F. Arbuckle.

The nasal accessory sinuses are present and may become infected even during early infancy. The symptoms of sinus infection are general as well as local, and the diagnosis is based on these general symptoms as well as on the local manifestations. The roentgen ray is helpful in diagnosis, but a final conclusion is reached on the basis of direct rhinoscopy, a pure white light being used. About 95 per cent of children with sinus infection recover following local treatment consisting of irrigations with 10 per cent glucose solutions and the instillation of weak solutions of mercurochrome-220 soluble.

Mastoiditis in Infants. Dr. A. M. Alden.

Infants may suffer from a severe type of mastoid infection capable of producing profound constitutional symptoms and even death, without any of the usually recognized signs of mastoiditis being present. The involvement of the middle ear may be slight, the infection being confined largely to the mastoid antrum and cut off from the middle ear by swelling of the mucous membrane, occluding the aditus ad antrum. Routine autopsies on infants succumbing to severe diarrhea of the cholera infantum type revealed, almost without exception, infection in the mastoid antrum, usually bilateral. The diagnosis of mastoid infection during life is made on the basis of the general symptoms of diarrhea, hydrolability and fever, unaccounted for by infection elsewhere, and on certain characteristic local signs, the most important of which are a change from the normal color of the drum and a sag in the superior wall of the external auditory canal. Only rarely are redness, swelling and tenderness of the mastoid observed. In a certain number of instances, repeated incisions of the drum membrane effect satisfactory drainage, but in many, complete drainage is not accomplished until the mastoid antrum is opened. The operation of antrotomy, or postauricular drainage, is a simple one and can be performed under local anesthesia. There is practically no shock and no operative mortality. The operation is usually followed by prompt cessation of symptoms. Cultures from the mastoid antrum have usually revealed the presence of a hemolytic streptococcus.

Hidden Mastoiditis. Dr. P. C. Jeans.

Six cases of mastoiditis in young infants were reported in which the clinical signs of mastoiditis were either obscure or absent. Three of the infants had been gaining in weight rapidly and apparently making satisfactory progress in every way when death occurred suddenly and unexpectedly. The only

demonstrable lesion at autopsy in each of the three cases was bilateral chronic mastoiditis.

Another infant developed otitis media during convalescence from bronchopneumonia. Good drainage was established by myringotomy. The infant did well for a time and then suffered severe syncopal attacks. In several of these attacks, death seemed imminent. Examination revealed bulging of the posterior superior canal walls, and mastoidectomy was performed. The mastoid cells were filled with thick pus, and the bones showed sclerotic changes. Two of the infants were gaining well and seemed in good health but suffered from a moderate diarrhea and excoriated buttocks. Both of these were found to have chronic mastoiditis. In two of the cases, there was no fever; in the others, the fever was of moderate degree.

NEUROSYPHILIS. DR. J. V. COOKE.

As a result of a study of 1,158 children with hereditary syphilis, in 55 per cent of whom examinations of the spinal fluid were made, the following information as to age and race relation of latent and active neurosyphilis was obtained:

In white syphilitic infants, under 2 years of age, 40 per cent had involvement of the central nervous system, as shown by positive Wassermann reactions on the spinal fluid. In only 20 per cent of these cases, however, was there evidence of clinical neurosyphilis; or, in other words, active neurosyphilis was present in approximately 8 per cent of the white syphilitic infants. In colored syphilitic infants under 2 years of age, only 20 per cent had neurosyphilis and only 20 per cent of these showed clinical evidence of the disease. The incidence of active neurosyphilis in colored syphilitic infants was therefore only 4 per cent, or one-half of that in white infants. In older syphilitic children, the higher incidence of neurosyphilis in the white race was still more marked. Thirty-three per cent of the white children over 2 years of age had had neurosyphilis; more than one-half of these showed marked clinical evidences of involvement of the nervous system. In older colored children only 12 per cent had neurosyphilis, and only 12 per cent of these had clinical manifestations. There is a slightly higher incidence of clinical neurosyphilis in white males as compared with white females and a more marked increase in colored boys as compared with colored girls.

EXPERIENCES WITH SULPHARSPHENAMINE. DR. M. L. FLOYD.

Reactions following the injection of sulpharsphenamine usually are manifested in the form of skin lesions, appearing at any time from two hours to six weeks following the injection. In all the patients observed who showed reactions, there was at some time a pallor and puffiness of the eyes, face and ankles without definite pitting on pressure. Skin rashes were more severe when they occurred soon after the injection. In some instances, the rash was clinically indistinguishable from that of scarlet fever. In others, it was practically identical with that of measles. Gingivitis and stomatitis were frequently present. Fever varying from 101 to 105 was a constant phenomenon in reactions after the administration of sulpharsphenamine. Jaundice was observed in one patient. In two, there was a hemorrhagic encephalitis. One of these patients recovered following treatment with sodium thiosulphate. This drug is indicated in all types of reaction following injection of sulpharsphenamine, as it is the most effective antidote for arsenic. Reactions in susceptible patients apparently can be aborted by the administration of sodium thiosulphate a few hours after the injection of the sulpharsphenamine.

CLINIC ON NEUROSYPHILIS. DR. PAUL J. ZENTAY.

Six cases of congenital neurosyphilis were presented; two cases of juvenile general paralysis; one case on the borderline of juvenile general paralysis; one of simple mental deficiency; one of hemiplegia with mental deterioration, and one showing fixed pupils and absent deep reflexes on the lower extremities, which was classified as questionable juvenile tabes.

CONGENITAL MOTOR INSTABILITY OF THE CHOREIFORM TYPE. DR. PAUL J. ZENTAY.

A child, aged 6 years, was presented who had shown choreiform movements of the face and extremities since birth. Physical and mental development were normal, and aside from certain peculiarities of personality and motor restlessness all observations were negative. The nature of the trouble was discussed briefly.

ACUTE ABDOMINAL SYMPTOMS IN THE COURSE OF DIABETES. DR. A. F. HARTMANN.

Eight cases were reported in which acute abdominal symptoms occurred during the course of diabetes in children.

In two of the cases acute appendicitis existed; in the remaining six, as far as could be determined, no infection in the gastro-intestinal, urinary or respiratory tracts could account for the symptoms observed. The symptoms were chiefly nausea, vomiting and abdominal pain, with general muscular rigidity and tenderness, most marked in the right upper quadrant. In all cases, these symptoms and signs occurred in the patients developing acetone body acidosis from one cause or another. In no case was fever present. In all cases there was extreme leukocytosis ranging from 30,000 to 55,000, with an actual increase in the number of polymorphonuclears. In all of the six cases, prompt treatment of the acidosis by fluid, glucose and insulin was followed in an incredibly short time (about twelve hours) by complete disappearance of symptoms and the return to normal of the leukocyte count. Subsequent study of the gastro-intestinal tract has not revealed any anomalies or any suggestion of inflammation.

COMPARISON OF THE ACID BASE EQUILIBRIUM OF THE BLOOD IN INFANTS FED ON SWEET AND SOUR COW'S MILK. DR. DAN C. DARROW.

It has been claimed that the feeding of milk to which acid has been added results in disturbances of the acid base equilibrium of the body. Studies on a group of eight infants revealed the fact that no significant changes in the blood chemical determinations occurred as the result of the change from sweet to lactic acid milk. The carbon dioxide dissociation curve of the blood, the venous oxygen and carbon dioxide content of the whole blood, the serum chlorides, the total base and the lactic acid content of the blood remained at a constant normal level in all infants, with the single exception of one patient who developed a diarrhea while being fed on a sweet milk dilution. No evidence was found that lactic acid added to cow's milk produced any harmful effects or any alteration of the acid base equilibrium.

METHODS OF LUNG MAPPING. DR. J. J. SINGER.

Intrabronchial introduction of iodized oil 40 per cent followed by roentgenologic examination is a valuable method in pulmonary diagnosis. No anesthesia need be used in introducing the oil. With the patient lying on the

infected side, the tongue is extended as far as possible, and the oil is introduced through a straight cannula placed at the base of the tongue and behind the uvula. The amount of oil used is between 10 and 20 cc. It should be warmed to body temperature before injecting. The danger incident to the use of the oil is minimal, although occasionally iodine rashes are observed when a portion of the oil has been swallowed. The method is particularly valuable in the diagnosis of bronchiectatic cavities and bronchial fistulas.

ROENTGEN-RAY STUDIES OF THE COLON IN CHILDREN. DR. J. W. LARIMORE.

From a series of fluoroscopic observations made on young infants, it seems likely that the variations in the colon observed during later life are dependent on congenital anomalies rather than on acquired characteristics. All of the variations seen in adults were found in young infants. These include local redundancy, variation as great as 100 per cent in the length of the entire colon, great relative increases in length of the right colon arising as the result of initial hyperrotation and extreme descent of the cecum, absent hepatic flexure, open splenic flexure and absence of the rectosigmoid apparatus. Obstinate constipation in young children has often been found to be associated with distant redundancy of the colon. Clinical associations of hyperrotation or of a long, right colon in which the hepatic flexure is high above the right iliac crest and the cecum low in the pelvis have varied. There has been constipation, the pains suggesting chronic appendical irritation or chronic dyspepsia with bloating. In a few instances in older children with this type of colon, attacks of cyclic vomiting have occurred. Early recognition of these individual variations may be of value in the prevention of acquired malfunction.

DISEASES BENEFITED BY SPLENECTOMY. DR. M. B. CLOPTON and DR. MCKIM MARRIOTT.

Conditions that are especially benefited in children by splenectomy are hemolytic jaundice, thrombocytopenic purpura hemorrhagica and the various types of splenic anemia, including Banti's disease. Cases illustrating each of these conditions were presented. A patient with congenital hemolytic jaundice was the third member of the family suffering from the same condition. There was rapid disappearance of the jaundice following splenectomy. A girl having Banti's disease developed the characteristic symptoms at the age of 5. At the age of 7, she had a large spleen, small liver, ascites and intestinal hemorrhages. The red blood cells numbered 936,000, and the hemoglobin content was 15 per cent. The spleen was removed. The patient is now aged 15 and is in good physical condition. The blood count is normal. The differential count shows a slight increase in eosinophils and large mononuclear cells.

A third patient had had a large spleen and marked anemia since the age of 3. There were no hemorrhages and no ascites. Splenectomy was performed at the age of 7. The patient is now aged 9 years and is normal in every respect.

Four cases of purpura of the thrombocytopenic type were presented. In each instance removal of the spleen resulted in shortened bleeding time and an increase in the blood platelets, with marked improvement in the general condition. In one of these cases, however, there has been a recurrence of the hemorrhages one year after the operation. The other patients have remained free from hemorrhages.

Program for Friday Afternoon, Oct. 22, 1926

Apophysitis of the Os Calcis. Dr. B. S. Veeder.

Studies in Pubescent Growth. Dr. B. S. Veeder and Dr. E. H. Rohlfing.

A Unique Case of Hydrocephalus. Dr. M. J. Lonsway.

The Effect of Change in Posture on Circulation Rate and Renal Activity in Man. Dr. H. Lester White.

Studies in Intestinal Bacteriology. Dr. A. I. Kendall.

Spontaneous Pneumothorax in Infancy. Dr. E. A. Graham.

Notes on Enlargement of the Spleen in Children. Dr. A. S. Bleyer.

The Diagnosis of Brain Tumors in Children. Dr. Ernest Sachs.

An Unusual Syndrome Associated with Rickets. Dr. J. D. Boyd, Iowa City.

Study of a Child with Exopthalmic Goiter. Dr. D. Walthall, Kansas City.

Intravenous Mercurochrome in Pyelitis. Dr. Park J. White.

Carbohydrate Studies in Arthritis. Miss Martha V. Nelson, Iowa City.

The following papers were illustrated by moving pictures:

Sexual Precocity. Dr. E. H. Schorer, Kansas City.

Pediatric and Orthopedic Phases of Some Common Diseases in Childhood: *A.* Spastic Paralysis. Dr. T. C. Hempelmann. *B.* Infantile Paralysis with Special Reference to Leg Lengthening. Dr. Leroy Abbott.

Posture Films of the Children's Bureau.

APOPHYSITIS OF THE OS CALCIS. DR. B. S. VEEDER.

Three cases of apophysitis of the os calcis were reported. All the patients were boys whose ages ranged from 9 to 16. All were active, strong and otherwise well. Characteristic symptoms were bilateral pain in the heels on walking, slightly tender spots over the os calcis and marked pain on contraction of the Achilles tendon. Roentgenograms showed the changes characteristic of osteochrondritis juvenilis. There was no evidence of new bony growth. The condition is to be distinguished from bone tuberculosis. The treatment in severe cases consists of rest in bed and the application of plaster casts.

STUDIES IN PUBESCENT GROWTH. DR. B. S. VEEDER and DR. E. H. ROHLFING.

The study of a group of boys ranging from 10 to 16 years of age in a private school revealed the fact that a much closer estimate of the actual nutritional condition of the individual can be obtained by the use of a two scale measurement (height for weight and weight for chest) than when a single scale is used. Studies in periodic growth of the same group of boys over a period of six years showed that the maximum gain occurred between the months of October and January for the group as a whole. After the fifteenth year, the gains during the summer vacation from June to September were distinctly less than at any other period of the year. A number of boys actually lost weight during the summer vacation.

A UNIQUE CASE OF HYDROCEPHALUS. DR. M. J. LONSWAY.

A case of hydrocephalus was demonstrated, in which the patient was normal at birth and the head normal in size. By the third week of life it was noted that the head was increasing rapidly, the increase having been 3.5 cm. since the time of birth. Lumbar puncture was done, and 10 cc. of slightly turbid fluid was removed. The head increased 1 cm. in circumference during the next twenty-four hours. The administration of theobromine sodiosalicylate was then begun. The head decreased in size during the subsequent two weeks.

The fontanel became soft, and the eyes no longer turned downward. At the age of 6 months, the circumference of the head was within normal limits, no further increase having occurred.

THE EFFECT OF CHANGE IN POSTURE ON CIRCULATION RATE AND RENAL ACTIVITY IN MAN. DR. H. LESTER WHITE.

The circulation rate is approximately 44 per cent greater in the recumbent posture than in the standing and the pulse pressure is 39 per cent greater, the increase in pulse pressure being due to a fall in diastolic rather than a rise in systolic pressure. The volume output of the urine is 237 per cent greater in the recumbent posture, and the output of bicarbonate is 549 per cent greater; the output of chloride is 123 per cent greater. The output of ammonia and creatinine is unchanged by change in posture and the outputs of phosphorus, sulphate and urea are increased only by approximately 50 per cent. These figures are interpreted as indicating that the diuresis occurring during recumbency is the result mainly of an increased rate of glomerular filtration rather than of a diminished tubular reabsorption. The experiments also seem to indicate that bicarbonate and chloride are eliminated solely by filtration, whereas phosphate, sulphate and urea are eliminated largely by tubular secretion and that ammonia and creatinine are eliminated entirely by tubular secretion.

STUDIES IN INTESTINAL BACTERIOLOGY. DR. A. I. KENDALL.

The intestinal tract often harbors a few gas bacilli. In some instances these organisms are numerous. Recent studies have shown that the gas bacillus is capable of producing large amounts of a histamine-like substance, which is extremely reactive physiologically.

SPONTANEOUS PNEUMOTHORAX IN INFANCY. DR. E. A. GRAHAM.

Congenital pneumothorax during infancy may be due to congenital cysts of the lung. A number of cases of this condition have been reported, and others doubtless have been overlooked. Treatment is unsatisfactory, as the diagnosis usually is not made until the patient is moribund. Removal of an involved lobe might be a feasible method of treatment if the diagnosis were made before the development of pneumothorax.

NOTES ON ENLARGEMENT OF THE SPLEEN IN CHILDREN. DR. A. S. BLEYER.

Further observations on the enlargement of the spleen in measles were reported. In a summary of all the patients examined (517), the spleen was said to have been enlarged in 56 per cent. The splenic enlargement decreased abruptly after the rash. In diphtheria and scarlet fever, the spleen was enlarged in a few instances only. In none of the other common diseases of children was a specific reaction found comparable to that in measles. In a group of 1,700 apparently healthy infants, enlargement of the spleen during the middle months of the first year occurred in 26 per cent; during the second year the spleen was found enlarged in only 9 per cent.

THE DIAGNOSIS OF BRAIN TUMORS IN CHILDREN. DR. ERNEST SACHS.

Brain tumors in children present a somewhat different problem than in adults. The cardinal symptoms that are ordinarily described as characteristic of brain tumor, headache and vomiting and changes in the eye grounds are

frequently absent, probably because the skull gives way at an early stage with increased intracranial pressure. Roentgenograms in these cases show separation of the sutures at an early stage, particularly in cases in which there is an internal hydrocephalus associated with the tumor; it has seemed more desirable to operate in these cases in two stages, permitting the brain stem to adjust itself as a result of a decompression operation, and then secondarily to go in for the tumor. By the use of this procedure and the free use of blood transfusion, I have been able to treat these patients successfully, when former attempts had been unsuccessful.

AN UNUSUAL SYNDROME ASSOCIATED WITH RICKETS. DR. J. D. BOYD.

Three cases of active rickets of an unusual type were presented. The roentgenograms showed the characteristic changes of rickets, and there was in each instance a marked reduction of the inorganic phosphates. In none of these cases did any improvement occur following the administration of cod liver oil and dietary regulation. There was distinct retardation of growth in all. Two of the patients had chronic infections in the chest; one had glycosuria, which was not affected by insulin, and another had a constant albuminuria. The rickets seemed to be the result of metabolic disturbances rather than of vitamin deficiency; hence the failure to respond to treatment as long as the underlying causes were present.

STUDY OF CHILD WITH EXOPHTHALMIC GOITER. DR. D. WALTHALL.

A girl, aged 3 years, had presented all the characteristic symptoms of exophthalmic goiter since the age of 1 year. At the age of 3, thyroidectomy was performed with excellent results. In only one other case has exophthalmic goiter been reported in a child so young.

INTRAVENOUS MERCUROCHROME IN PYELITIS. DR. PARK J. WHITE.

In a case of pyelitis of one week's duration in a girl, aged 4 years, the injection of mercurochrome-220 soluble intravenously was followed by an abrupt drop in temperature and improvement in the general condition. The improvement, however, was only temporary. Three subsequent injections at weekly intervals were given, and similar temporary improvement occurred after two of the injections. Subsequently, the child was found to have a dilated ureter on one side. The amount of mercurochrome given was insufficient to have been excreted in sufficient concentration to bring about any disinfection of the kidney pelvis. Any favorable effect observed must have been the result of a nonspecific reaction caused by alteration of the blood proteins or by hemolysis. The effect is probably analogous to that of intravenous injection of distilled water.

CARBOHYDRATE STUDIES IN ARTHRITIS. MISS MARTHA V. NELSON.

In a group of arthritic patients including both children and adults, a high blood sugar and an abnormal blood sugar curve following the administration of carbohydrates was observed. A comparison was made of the effects of low and of high carbohydrate diets on these patients. It was found that low carbohydrate diets did not change the type of blood sugar curve and that the feeding of an average amount of carbohydrate did not increase the arthritic

symptoms, nor was there any appreciable change in the blood sugar level. It was concluded that the feeding of low carbohydrate diets to arthritic patients, as has been advocated by some physicians, is ineffective.

SEXUAL PRECOCITY. DR. E. H. SCHORER.

Histories of ten cases of sexual precocity were presented. One of these was in a child less than 4 years of age. The only treatment found of value in these cases was one based on psychologic grounds. Cases of this type are uninfluenced by drugs.

PEDIATRIC AND ORTHOPEDIC PHASES OF SOME COMMON DISEASES IN CHILDHOOD.

A. SPASTIC PARALYSIS. DR. T. C. HEMPELMANN.

A summary of the results of treatment in 250 cases of spastic paralysis was given. The best results were obtained in children who were normal or nearly normal mentally, who had shown at least some improvement previously, who had no athetosis and who were willing and old enough to cooperate in the postoperative exercises. Treatment consisted, first, of correcting deformities due to contractures; this was followed by peripheral neurectomy on the nerves of supply to the spastic muscles, and finally by a long period of supervised postoperative training with the aim of strengthening weak muscles and restoring proper balance to the opposed muscle groups. The results of treatment were illustrated by motion pictures.

B. INFANTILE PARALYSIS WITH SPECIAL REFERENCE TO LEG LENGTHENING. DR. LEROY ABBOTT.

Eleven cases in which the tibiae and fibulae were lengthened, and three cases in which the femora were lengthened, were reported. The lengthening was accomplished by the making of a long Z-shaped osteotomy followed by skeletal traction applied to both sides of the leg by means of a screw extension pressure. The average lengthening of the tibiae was 2 inches and of the femora, 2¼ inches. The operation has been used only on patients under 14 years of age who have suffered shortening as the result of poliomyelitis. The operation should be used with great caution on account of the danger of infection of the medullary canal. When the operation is successful, the results are much more satisfactory than when "lifts" are applied to the shoe.

Program for Saturday Morning, Oct. 23, 1926

A Case of Lymphatic Leukemia. Dr. Ellsworth Kneal.
A Case of Dermatitis Herpetiformis. Dr. William Weiss.
Cytology of Enteritis in Infancy. Dr. E. B. Woods.
Exudative Enteritis. Dr. John Zahorsky.
A Case of Chloroma. Dr. J. A. Rossen and Dr. James Knott.
Giardiasis. Dr. Mary McLoon.
Specific Treatment of Noma. Dr. H. L. Berger, Kansas City.
Hyperkeratosis Congenita. Dr. T. W. White.
A Case of Encephalitis. Dr. Ralph L. Cook.
Hemihypertrophy. Dr. H. L. Dwyer, Kansas City.
Treatment of Hydrocephalus by Cisterna Puncture. Dr. Jules Brady.
Intestinal Malformation. Dr. Jules Brady.
Frequency and Clinical Signs of Hunger in Infancy. Dr. Eugene Rosamond, Memphis.

A Case of Interstitial Keratitis. Dr. Erman Stadler.
Twisted Ovarian Pedicle in a Girl Ten Years Old. Dr. G. Lippmann.
A Case of Bromism Neonatorum. Dr. J. P. Costello.
Congenital Heart Disease. Dr. A. G. Pohlman.

A Case of Lymphatic Leukemia. Dr. Ellsworth Kneal.

In a boy, aged 7 years, the first symptoms noticed were respiratory difficulty and a cough of paroxysmal type. Roentgenograms revealed a large mediastinal mass. The temperature was normal. The red blood cell count was 5,400,000; hemoglobin, 75 per cent; white cell count, 12,600; differential: polymorphonuclears, 82 per cent. Several deep roentgen-ray treatments were given, and the mediastinal mass decreased in size during the following two months. The patient, however, became anemic, and numerous subcutaneous hemorrhages were present over the body and limbs. The red blood cell count fell to 1,220,000 and the hemoglobin to 28 per cent; the white cell count rose to 531,000. The differential count showed: polymorphonuclears, 8 per cent; large mononuclears, 2 per cent; small mononuclears, 80 per cent. The spleen was enlarged to four fingerbreadths below the costal margin. Two doses of mercurochrome-220 soluble were given intravenously. Following this the spleen decreased in size and the red blood cell count increased from 1,220,000 to 2,020,000. While undergoing treatment, the patient developed symptoms of intestinal obstruction and was operated on. A volvulus was found and released. He died a few hours later.

A Case of Dermatitis Herpetiformis. Dr. William Weiss.

A case of dermatitis herpetiformis in a white boy, aged 5 years, was presented. The condition of the skin had existed since the age of 3 years. Treatment of various types had been tried without success. There were a few dry lesions on the head, blebs on the body and dry lesions and erythema over the neck, face and chest, as shown in figure 3. The patient had been receiving Fowler's solution daily, without effect. Treatment consisted of the intramuscular injection of sterile milk. Eight injections, varying in amount from 2 to 3 cc., were given over a period of two months. Considerable improvement of the skin lesions occurred following these injections, but a few lesions remained, as shown in figure 4. These disappeared following an attack of measles eight months later. The patient now shows no evidence of the dermatitis herpetiformis.

Cytology of Enteritis in Infants. Dr. E. B. Woods.

Microscopic examination of the cells occurring in infant stools gave information of clinical value in differentiating the various types of enteritis. The Houghwout technic of staining the fresh wet smears is suitable.

Exudative Enteritis. Dr. John Zahorsky.

The microscopic observations of the stools of infants suffering from exudative diathesis were described. These were: (1) the presence of mucous curls in large numbers; (2) cellular infiltration of the curls; (3) cellular plaques, and (4) free mononuclear cells and an absence of macrophages. The conclusion was drawn that many of the digestive disturbances of infants are caused by an exudative inflammation of the intestinal mucosa similar to erythema and eczema occurring on the skin. Whether or not the phenomenon is truly allergic remains undetermined. The name "exudative enteritis" was proposed for the condition.

A Case of Chloroma. Dr. J. A. Rossen and Dr. James Knott.

A case of chloroma in a patient, aged 3½ years, was reported. The first symptom noted was severe pain of short duration in the ear. At about the same time the eyes became prominent, the right bulging more than the left. The patient became progressively anemic. Several small tumors were felt over the skull. The spleen was slightly enlarged, and there was slight general glandular enlargement. Roentgenograms revealed no changes in the bones. The blood picture was similar to that seen in myelogenous leukemia. Deep roentgen-ray therapy was instituted, and there was a marked decrease in the size of the tumor masses in the skull. At the same time the white blood cell count fell from 60,000 to 14,000. The anemia, however, was progressive, the red blood

Fig. 3.—Appearance of boy having dermatitis herpetiformis.

cell count finally dropping to 1,000,000. Transfusions produced little benefit. The patient succumbed to a lobar pneumonia. At autopsy the tumors were found on the dura, in the fatty tissues of the orbit, unattached to the bone, and in the kidneys and pancreas. There were no tumors in the spleen or liver.

Giardiasis. Dr. Mary McLoon.

Five cases were reported in which cysts or motile forms of *Giardia lamblia* were found in the stools. The patients, all but one of whom were infants, were suffering from a diarrhea of chronic type.

Specific Treatment of Noma. Dr. H. L. Berger.

A case of gangrenous stomatitis in an infants, aged 16 months, did not follow any other illness. The gangrenous area was extensive, involving more

than one half of the right cheek and the angle of the mouth. There was sloughing of the gums, as shown in figure 5. Spirochetes and fusiform bacilli were found in smears from the lesions. Three intravenous doses of neoarsphenamine, of 0.2, 0.3 and 0.15 Gm., respectively, were given over a period of ten days. Potassium chlorate was given by mouth in a dosage of 5 grains (0.32 Gm.) five times a day. The mouth was cleaned wtih hydrogen peroxide followed by tincture of myrrh. Ten per cent silver nitrate was applied twice. A definite line of demarcation ultimately formed, and the gangrenous area was

Fig. 4.—Appearance of dermatitis herpetiformis after eight injections of sterile milk.

removed by cautery. The patient made an uneventful recovery and is at present in good condition, although there is a small amount of fibrous contracture about the angle of the mouth, as shown in figure 6.

HYPERKERATOSIS CONGENITA. Dr. T. W. WHITE.

In a case of hyperkeratosis congenita, the infant's skin was dry, hard and scaly at birth and had shown little change since. The skin of the entire body was involved. Deep fissures occurred at all joints. There was much scaling. The patient, since birth, had sloughed off at least one complete layer of skin. Treatment was unavailing.

Fig. 5.—Gangrenous stomatitis, involving right cheek and angle of mouth.

Fig. 6.—Appearance of patient after treatment of gangrenous stomatitis, showing resultant small amount of fibrous contracture about angle of mouth.

A Case of Encephalitis. Dr. Ralph L. Cook.

In a case of encephalitis of unknown origin in a child, aged 4 years, nothing abnormal was found in the spinal fluid. The temperature was high, and numerous convulsions occurred. Following the acute stage of the course, there was a change in disposition. Convulsions recurred at long intervals, but there was ultimately a complete recovery.

Hemihypertrophy. Dr. H. L. Dwyer.

Three cases of hemihypertrophy were described. In two of the patients there was complete hemihypertrophy which had been present since birth. One of these was in a negro (fig. 7) and the other in a white infant. In the third patient, a girl, aged 16, the hypertrophy was confined to one lower extremity.

Fig. 7.—Hemihypertrophy in negro infant.

There was a large angioma on the dorsum of the enlarged foot. The condition is not hereditary. It is usually accompanied by vascular changes on the affected side.

Treatment of Hydrocephalus by Cisterna Puncture. Dr. Jules Brady.

In a case of hydrocephalus following intracranial hemorrhage, the patient, aged 2½ years, had suffered the hemorrhage at birth. Four cisterna punctures were performed during the first week of life, and punctures were repeated at intervals during the following six weeks. The first fluid removed contained much blood. The fluids by later punctures were slightly blood tinged. At the time of the last puncture, at six weeks of age, 240 cc. of fluid was removed. The circumference of the head was 16 inches at 2 weeks, 17 inches at 6 weeks and

19¾ inches at 1 year. There was an enlargement of only ¼ inch during 1½ years. The child's development was slower than normal, but further enlargement of the head seems to have been prevented by the cisterna punctures.

INTESTINAL MALFORMATION. DR. JULES BRADY.

A case of congenital hernia through the mesocolon was reported in an infant, one of twins, who weighed 4 pounds (1.8 Kg.) at birth and vomited during the first day of life. Neither food nor water was retained. No peristaltic waves were seen, and no tumor was felt. A barium meal failed to pass beyond the stomach. An operation was performed the fifth day of life. No thickening of the pylorus was observed, but the transverse colon was adherent to the anterior wall of the stomach in such a way as to obstruct the pylorus. There was a congenital opening in the transverse mesocolon through which loops of ileum had herniated. The infant made an uneventful recovery, and at the age of 9 months weighed more than 20 pounds (9 Kg.).

FREQUENCY AND CLINICAL SIGNS OF HUNGER IN INFANCY. DR. EUGENE ROSAMOND.

Hunger is the most frequent cause of infant discomfort and of the symptoms commonly referred to as "colic." Complementary feeding in the case of breast-fed babies and increased feeding in the artificially fed is the specific treatment.

A CASE OF INTERSTITIAL KERATITIS. DR. ERMAN STADLER.

A child, aged 13 years, showing notched incisors, scars at the angle of the mouth and enlarged epitrochlear glands, was given intensive antisyphilitic treatment consisting of sulpharsphenamine and mercury. Treatment was continued for only two weeks, and the child returned three months later with typical interstitial keratitis. The keratitis was not present before treatment was begun. The Wassermann reaction was positive in the child and in both parents.

TWISTED OVARIAN PEDICLE IN A GIRL TEN YEARS OLD. DR. G. LIPPMANN.

A girl, aged 10 years, had complained of occasional pain in the left side of the abdomen occurring at intervals. The pain was severe and was accompanied by vomiting and slight temperature. During one of the attacks, which was especially severe, the patient was brought to the hospital. The temperature rose to 38.6 and the white blood cell count to 23,800. There was general abdominal tenderness, and a mass was present in the midline just above the symphysis. At operation a large ovarian cyst with a twisted pedicle was removed. Recovery was uneventful.

A CASE OF BROMISM NEONATORUM. DR. J. P. COSTELLO.

A bromide eruption caused by placental transmission was described. This case was reported in full in the *Archives of Dermatology and Syphilology* (**7**:806 [June] 1923).

CONGENITAL HEART DISEASE. DR. A. G. POHLMAN.

The anatomic and embryologic factors involved in congenital cardiac disease were discussed (illustrated by blackboard diagrams).

Book Reviews

CONVULSIONS ET ÉPILEPSIE CHEZ LES ENFANTS. By ANDRÉ COLLIN. Pp. 200. Price, 21 francs. Paris: Gaston Doin & Cie, 1926.

The material presented is based on a large clinical experience and a careful study of the physiology of the central nervous system of the child. It is well known that young nervous tissue is peculiarly apt to manifest the convulsive state. The author discusses three factors which make for this aptitude in the infant: (1) histologic and functional isolations of the nerve cells; (2) frequent disturbances of the calcium concentration, and (3) insufficient development of the suprarenals, parathyroids and thyroids, which in the adult play an antitoxic rôle.

Convulsions, due to these factors, may then be considered as benign, which distinguishes them from manifestations of epilepsy. Their symptomatology may be explained without the participation of the cortex. They are predominantly clonic and bilateral and are not accompanied by a period of stertor; they frequently are precipitated by fever and never come on during sleep. They may occur in older children who present a retarded nervous development. In treatment, the supplying of calcium is of value, as is also alkalinization because of its calming effect on the bulbo medullary centers. Such patients are cured by growing up.

On the other hand, the symptoms of epilepsy are those which imply an active participation of the cortex. The convulsions start unilaterally and are apt to be tonic in character, producing asphyxia. They are apyretic and may come on in sleep or immediately after waking. These are true cases of epilepsy, but present hope of recovery. If, however, there is loss of consciousness or equivalent states and in older infants the coexistence of mental debility, the progress is unfavorable. The author advises "playing the chance of syphilis" in treatment. He also has had considerable success with injections of mercury and offers several hypotheses to explain their therapeutic effects. The value of the ketogenic diet is said to be the result of the calming action of acidity on the cortex.

There is sufficient new material presented to make the book of distinct value to any one particularly interested in the subject.

Directory of Pediatric Societies

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SECTION OF DISEASES OF CHILDREN

Chairman: Dr. Henry Gerstenberger, 2103 Adelbert Road, Cleveland.
Secretary: Dr. Hugh McCulloch, 500 Kingshighway, St. Louis.
Place: Washington, D. C. Time: May 18, 19 and 20.

AMERICAN PEDIATRIC SOCIETY

President: Dr. Isaac A. Abt, 104 S. Michigan Ave., Chicago.
Secretary: Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Place: Cruise on Chesapeake Bay. Time: May 12 to 16.

THE ASSOCIATION OF AMERICAN TEACHERS OF THE DISEASES OF CHILDREN

President: Dr. Frank P. Gengenbach, 452 Metropolitan Bldg., Denver.
Secretary: Dr. Paul W. Emmerson, 86 Bay State Road, Boston.
Place: Willard Hotel, Washington, D. C. Time: May 17, 1927.

AMERICAN CHILD HEALTH ASSOCIATION

President: Mr. Herbert Hoover, Department of Commerce, Washington, D. C.
Secretary: Dr. Philip Van Ingen, 125 E. 71st St., New York City.
Place: Washington, D. C. Time: May 9 to 11.

CANADIAN SOCIETY FOR THE STUDY OF DISEASES OF CHILDREN

President: Dr. Howard Spohn, 718 Granville St., Vancouver, B. C.
Secretary: Dr. Frederick F. Tisdall, 102 College St., Toronto, Ont.
Place: Toronto or vicinity. Time: June 13 and 14.

SECTIONAL

CENTRAL STATES PEDIATRIC SOCIETY

President: Dr. O. L. Goehle, 15703 Detroit Ave., Lakewood, Ohio.
Secretary: Dr. H. T. Price, 121 University Place, Pittsburgh.
Place: Cleveland. Time: Early in November, 1927.

SECTION ON PEDIATRICS OF SOUTHERN MEDICAL ASSOCIATION

President: Dr. Robert A. Strong, Pass Christian, Miss.
Secretary: Dr. Hugh L. Dwyer, Brotherhood Block, Kansas City, Kans.
Place: Memphis, Tenn. Time: Nov. 14 to 17, 1927.

LOCAL

CHICAGO PEDIATRIC SOCIETY

President: Dr. George Baxter, 4603 Broadway, Chicago.
Secretary: Dr. J. K. Calvin, 104 S. Michigan Ave., Chicago.
Place: City Club. Time: Third Tuesday of each month.

THE PEDIATRIC SECTION OF THE ACADEMY OF MEDICINE OF CLEVELAND

Chairman: Dr. Henry J. Gerstenberger, 2103 Adelbert Road, Cleveland.
Secretary: Charles W. Burhans, Lakeside Hospital, Cleveland.
Place: 2009 Adelbert Road. Time: Feb. 10, May 7, Sept. 22 and Dec. 15.

DETROIT PEDIATRIC SOCIETY

President: Dr. Thomas B. Cooley, 987 Jefferson Avenue, East, Detroit.
Secretary: Dr. W. S. O'Donnell, 1563 David Whitney Bldg., Detroit.
Place: Children's Hospital of Michigan. Time: No fixed date; approximately once a month.

LOUISIANA STATE PEDIATRIC SOCIETY

President: Dr. L. R. De Buys, 1487 Delachaise St., New Orleans.
Secretary: Dr. F. J. Kinberger, 3601 Prytania St., New Orleans.
Place: New Orleans. Time: April 25, 1927.

MEMPHIS PEDIATRIC SOCIETY

President: Walter L. Rucks, 1074 Madison Ave., Memphis, Tenn.
Secretary: Dr. J. B. Blue, Columbian Mutual Tower, Memphis, Tenn.
Place: Baptist Memorial Hospital. Time: Second Tuesday of each month.

NEW ENGLAND PEDIATRIC SOCIETY

President: Dr. James Herbert Young, 66 Commonwealth Ave., Boston.
Secretary: Dr. Thomas Lanman, 286 Marlborough St., Boston.
Place: Boston Medical Library. Time: Second Friday of each month.

PEDIATRIC SECTION OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. Lewis C. Schroeder, 39 E. 61st St., New York City.
Secretary: Dr. William R. May, 8 East 66th St., New York City.
Place: New York Academy of Medicine. Time: Second Thursday of each month.

NORTHERN CALIFORNIA PEDIATRIC SOCIETY

President: Dr. C. F. Gelston, 384 Post St., San Francisco.
Secretary: Dr. Mary H. Layman, 2116 Pacific Ave., San Francisco.
Place: Alternates between Stanford University Hospital, University of California Hospital, and Children's Hospital. Time: Three or four times a season.

NORTHWESTERN PEDIATRIC SOCIETY

President: Dr. C. A. Stewart, 730 La Salle Bldg., Minneapolis.
Secretary: Dr. E. S. Platou, 730 La Salle Bldg., Minneapolis.
Place: Three at the Medical Campus, Minneapolis and one at the Town and County Club. Time: Winter, Spring, Summer, Fall.

PHILADELPHIA PEDIATRIC SOCIETY

President: Dr. Frederick Fraley (Retiring), Overbrook, Pa.
Secretary: Dr. John P. Scott, 2040 Pine St., Philadelphia.
Place: College of Physicians, 19 S. 22nd St., Philadelphia. Time: Second Tuesday of each month.

ST. LOUIS PEDIATRIC SOCIETY

President: Dr. Adrien S. Bleyer, University Club Bldg., St. Louis.
Secretary: Dr. Park J. White, 3903 Olive St., St. Louis.
Place: St. Louis Children's Hospital. Time: Third Friday in each month

SOUTHWESTERN PEDIATRIC SOCIETY

President: Dr. Joseph Shuman, 1136 West 6th St., Los Angeles.
Secretary: Dr. Wm. Sidney Bowers, 1136 W. 6th St., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.